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SECOND ISSUE
DECEMBER 1940
VOL. 33 NO. 24
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December 26, 1940

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Developments in the Los Angeles Basin

During 1940 Reviewed by Fields

The first Basin discovery since Wilmington was made by El Rey Oil Co. between Athens and Potrero in the early part of the year when its Westmore No. 1 was completed as a pumper of less than 100 bbls. capacity. Located on the northwest corner of Western Ave. and Imperial Highway, the well drilled to 9063 ft. but was plugged and finished in the Miocene sand interval from 8632 ft. to 9000 ft. which is roughly comparable to the Eighth Callender zone of Dominguez. The low production rate is attributed to the impermeability of the sands. The gravity of the oil, which is 30 degrees, is sufficiently high to encourage further exploration and it is probable that 1941 will see one or more new wells drilled in search of more permeable sands.

The second and most sensational find of the past year was the bringing in of R. E. Havenstrite's Lincoln No. 1 at Del Valle. Also producing from the Miocene, this well made a large amount of gas along with several hundred barrels of high gravity oil. At this particular structure appears largely in the hands of one operator, the greatest significance will probably lie in encouraging other companies to wildcat in the Castaic area.

At the same time the Havenstrites were bringing in Del Valle, R. R. Bush Oil Co. proved the existence of an 8500 ft. Miocene zone at Inglewood by completing Sentous No. 1 as a small well. The magnitude of this discovery can only be told by additional drilling but the two wells at the top of the zone will help immensely.

The third new field for 1940 was that discovered between the old Whittier and Brea Canyon fields by Fullerton Oil Co. It is described in detail elsewhere in this issue.

Montebello

Several fields experienced periods of unusual activity but none were of major boom proportions. During the first six months of 1940, there was

Standard wants lots of power in drilling its latest test in the Elk Hills area.

Oil men are sincere and critical students.

→

Construction of oil, gas and water lines in nearby oil areas called for thousands of tons of pipe. Shell is laying a line here from Bakersfield to Martinez.

some new drilling at West Montebello but most of the work was deepening to the Eight-Three zone which proved good in central locations. In the last few months, however, the field returned to its quietude of three years ago.

Dominguez

Development was active throughout the year at the west end of the Dominguez field but the producing area was not greatly enlarged, limits of Seventh and Eighth Callender zone remaining on properties held by Union Oil Co. and R. E. Havenstrite, operator.

Rosecrans

No large increase of productive territory was made in the South Rosecrans area but a fair amount of development work has clarified somewhat the rather obscure geology. The spectacular blow-out of the Rainbow Petroleum Co. well a few weeks ago is expected to renew interest in the easterly portion of the section.

Signal Hill

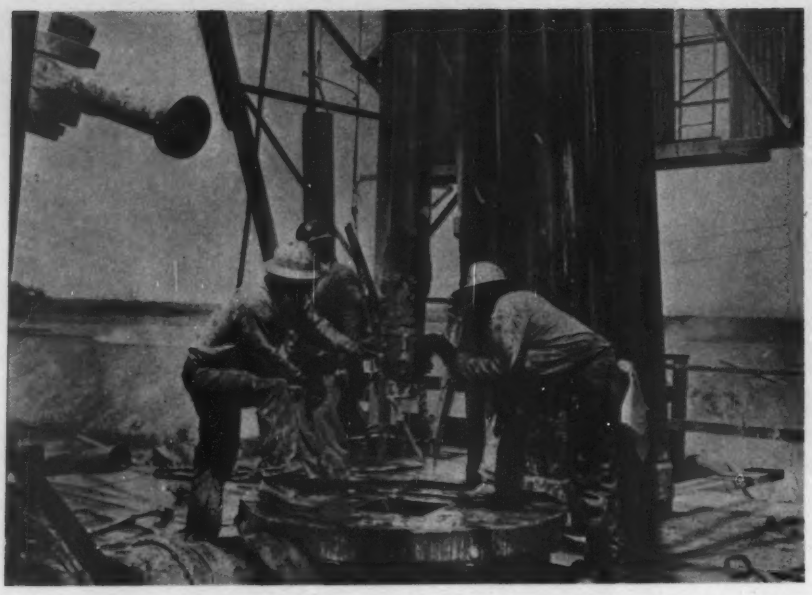
The Signal Hill field for a few months early in the year put on a miniature show reminiscent of its hey day when a stampete for the ultra shallow Upper Wilbur zone occurred in the Vista del Mar area. A number of new wells were drilled and many old ones plugged back or re-drilled, but aside from a few exceptions yields were discouragingly small and in most cases wet. Deep zone development remained at a standstill except for the starting by Union Oil Co. of an offset to Dormax Oil Co. No. 1 at the corner of 25th St. and Gardena Ave. Only recently having overcome its besetting circulation trouble, the well is approaching its 10,000 ft. goal.

Wilmington

Like "Old Man River", activity at Wilmington just keeps rolling along, there being as many strings of tools working now as a year ago. Productive limits were extended a few blocks to the northwest but development has been uniform throughout the entire field.

Southwest of the intersection of

Here is a group of geologists meeting recently in Los Angeles.



Bits continued to set new speed and accuracy record.

Figueroa St. and Highway No. 101 (State St.), Vesta Petroleum Co. completed a small well in sands probably equivalent to Ranger or Upper Terminal of Wilmington but no further attempt to link that field with Torrance was made until the present. Silver Petroleum Co.'s well, half a mile to the northeast, is now coring streaks of fair oil sand at 3500 ft.

Huntington Beach

With Signal Oil & Gas Co. developing the Signal-Bolsa lease at the west end, Huntington Beach saw more big completions during 1940 than in any year since the tideland drilling boom. Initial rates, in some cases have exceeded the 1000 bbls. mark and all have been above 100 bbls. Scattered drilling throughout the field, however, produced nothing of unusual interest.

East Coyote

1940, on the whole, was an active year for the entire East Coyote field, new production being obtained from Yorba Linda to the extreme west end. Several new wells at Yorba Linda initialled as high as 180 bbls. a day of heavy oil from about 2000 ft. but settled production averaged much under 100 bbls. and at present the area is quiet.

Success of Master Petroleum Co. in recompleting old wells in the Lemke zone between Carolina and Valencia Sts. precipitated a small boom but several near-failures on adjoining leases soon called a halt to the development. Wells that came in for 400 bbls. a day or better are now down to a fraction of that figure and all produce a high percentage of water.

Unlike the two other active areas of the field, however, the extreme westerly portion added materially to reserves during the year. Bartholomae Oil Corp. was successful in discovering a deeper zone the extent of which is not fully known, Union Oil Co.'s Toussau No. 2 just having pushed the known limit 1000 ft. to the southwest. Producing depth of wells varies from 6500 to 7300 ft. and yields range from 300 to 800 bbls.

Seal Beach

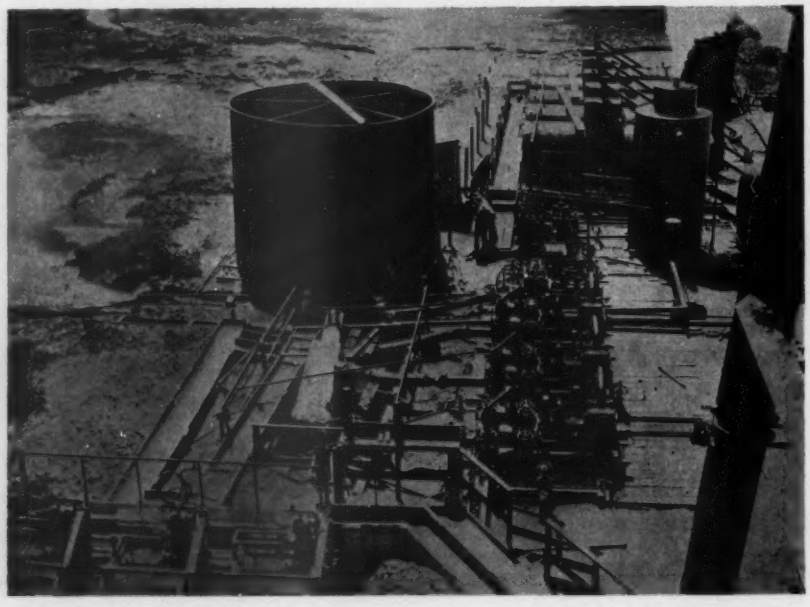
The Hellman Estate and Continental Oil Co. were successful in obtaining good wells in the easterly section of the Seal Beach field with initials from the 4800 ft. zone sometimes bettering 1000 bbls. a day. At present the Hellman interests are attempting to extend the producing area to the east with Well No. 6.

Brea

In November, Shell Oil Co., Inc. completed the only well drilled in the Brea field during the year. Production, with the hole open at intervals from 4300 to 5080 ft., was over 400 bbls. and Birch Oil Co. has started a new well to the south in hopes of obtaining a similar yield.

Santa Fe Springs

Santa Fe Springs remained quiet throughout the year, the only activity being the plugging of several deep wells to the Meyer zone where production in one or two instances was as high as 100 bbls. a day. Only



Boiler and pump manifold systems improved to cut many days of drilling time.

new work now in sight is a shallow gas test by Union Oil Co. and a Meyer zone well by the Hathaway Co.

West Side Fields

Nothing of unusual interest occurred in Torrance, Lawndale, Playa del Rey or El Segundo except in the latter field a well blew out while attempting to repressure the oil zone with gas from a 3800 ft. sand.

Athens

Early in the summer, Thorley Oil Co. proved the existence of 8000 ft. Miocene production in the Athens field by completing its deep test well for 225 bbls. a day. Two subsequent tries by different companies failed to exceed that figure, however, and development work ceased. The low production rate here, as in the El Rey well, is due to impermeable sand and it is probable that more exploratory work will be done in the near future.

Potrero

Only development of great interest in the Potrero field was Turf Oil Co.'s finding of gas and a little light oil deep in the Miocene on the Race Track property. Permeability of the sand was low and commercial possibilities are questionable.

Basin Oil Co. and Tide Water Associated Oil Co. continued to bring in satisfactory wells on the golf course.

This Kern Line crew paused a moment at Grapevine. They are, left to right, W. H. Waldron, Warren McKeon, W. C. Muslof, A. T. Turk, and H. T. Asgood.

Outlook for 1941

The year 1940 being one of development rather than discovery, 1941 must of necessity concern itself with exploration. To a great extent overlooked in recent years by major companies, Los Angeles and Orange counties are now receiving the attention they deserve and from all indications will be the scene of wildcatting by responsible operators from Castaic to Newport Beach. Great potentialities lie in the deep zones known to exist beneath the Inglewood, Potrero, and Rosecrans-Athens fields and without doubt new horizons will be opened in others.

Hoping for better luck than on Callender No. 81, is this Union Oil Co. crew on Callender No. 79. Left to right they are: William Otis, L. L. Mills, Lee O'Neil, Kent Garner, driller, and Bruce Gaulton

San Joaquin Valley Oil Men Hold Annual Dinner Meeting

With more than 250 oil men and civic leaders present, and with Gordon Garland, speaker of the State Assembly as the guest of honor, the San Joaquin Valley Oil Producers Association held its annual dinner meeting in Bakersfield last week.

Dana Hogan, president of the association, presided, and reported on the activities of the group during the past year. Among them were: appearances before

And, of course, the Christmas Hi-Jinks of the Wildcat Committee was one of the year's highlights.

the Cole committee at its California hearings last winter; a protest against the reciprocal trade treaty program which permits Venezuelan oil to come into this country at a drastically reduced tariff; protests against the importation of Mexican expropriated oil; protests against the severance tax proposed in the state legislature during the past biennium, and others.

Following Mr. Hogan's report, the Association went on record in the form of resolutions against Federal control of the oil industry; against the claim that the Federal government has any ownership over state tidelands; in favor of the Walter-Logan bill which provides for court review of regulations issued by boards and bureaus of the federal government; and pointing out the oil industry's readiness in the face of any emergency and its ability to carry out its part in the national defense effort.

Alfred Harrel, publisher of the BAKERSFIELD CALIFORNIAN, made a short talk in which he stressed the need for joint action of business and industry groups for the protection of their rights and interests against the encroachments of an all-powerful and overpowering government. Mr. Harrell stated that it was his opinion that if the American way of life is to be preserved as it has been known in this country, it will be necessary for all of the people to fight for its preservation. He mentioned the trip of the governor of California to Washington apparently to turn over the Central Valley Water project to the Department of the Interior as an illustration of an attitude which he deplored.

In conclusion, Mr. Harrell offered his full co-operation both as an individual and as a publisher to the industry in the fights which he foresees in the immediate future, pointing out that the success and prosperity of the oil industry were of vital importance not only to Bakersfield and Kern county, but also to the entire state.

Speaker of the Assembly Gordon Garland told the group of some of the problems facing the legislators, and of the formation of the economy bloc.

He mentioned the recent resignation of the director of state relief at the gov-

What's this, a rehearsal of the Wildcats party? Some prominent oilman's ears should be burning.

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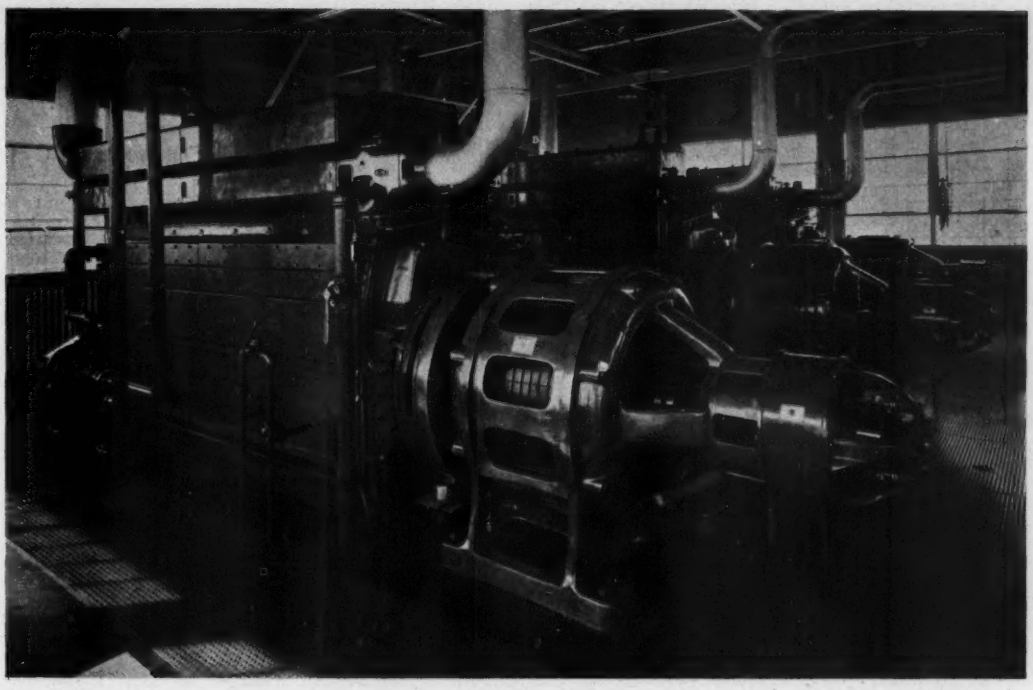

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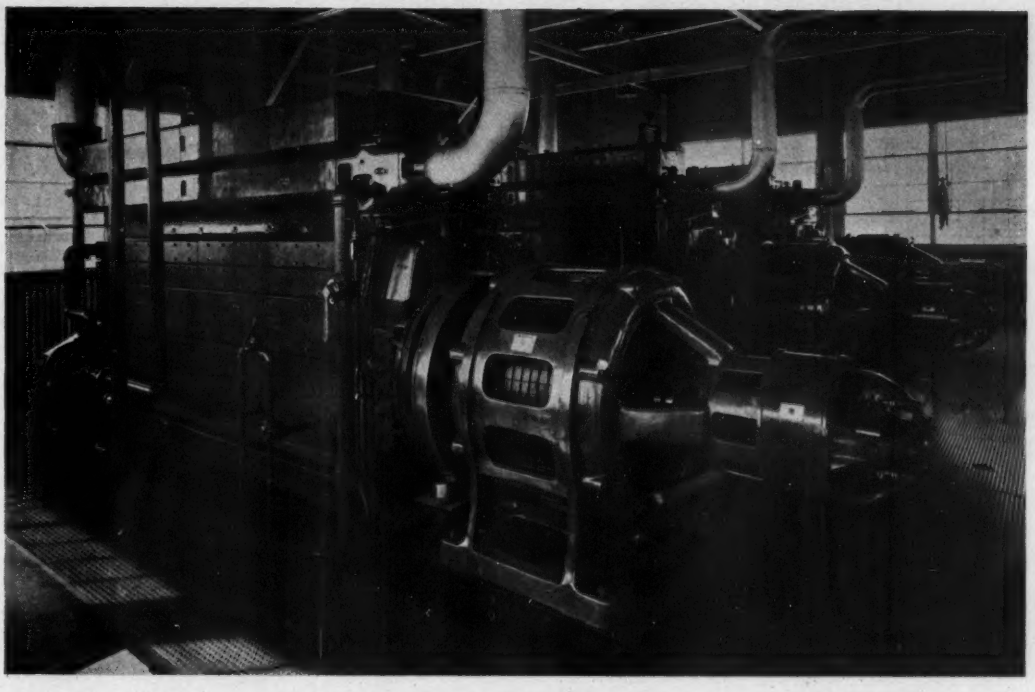

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Well, the radio mixer for the Wildcat's show is at last under control, and everybody appears to be happy.

ernor's demand, and said that he was unable to account for it except on the grounds that the governor did not want efficiency in that branch of the state government. Mr. Garland said that the director had been most satisfactory, and had rendered the state fine service.

In concluding, Speaker Garland said that he believed that state expenditures could be further reduced, and that they would be by the new legislature which will convene in January.

Members of the Association elected directors for the coming year. Those elected were: R. A. Broomfield, Jr., A. L. Marsten, Dana Hogan, E. E. Pyles, Wm. Keck, Jr., Thos. McManus, and Allan A. Jergins.

Gasoline Plant for DelValle Field

Erection of a natural gasoline plant for the Del Valle Gasoline Co. on its lease located three miles west of Castaic, Calif., is now under way acccording to the joint announcement of R. E. Havenstrite and R. E. Bering of that company. Parkhill-Wade, Los Angeles consulting and construction engineers, are in charge of operations.

The plant is designed to handle a maximum of 20,000,000 cu. ft. of natural gas per day at 450 pounds per sq. in. working pressure with a lean oil circulating rate of 125 gallons per minute. The daily distillation and stabilization capacity of the plant is 15,000 gallons of 26 lb. Reid finished gasoline.

Conventional in design, the plant will include a vapor recovery system while its features will be compact plant layout, automatic plant control, audible alarm signals and a patented Parkhill-Wade stabilizer cycle.

The main compressors and vapor recovery system will, in effect, make this a three-stage plant. Incoming gas from the field trap will pass through the scrubber and into the first compressor stage at 25 lbs. suction, go through the cooling tower, a second scrubber and through the second compressor stage where its pressure will be increased to 450 lbs. per sq. in. After passing through an orifice meter, the wet gas will then enter the absorber.

The vapor recovery system will take gas off the top of the crude gage tanks at atmospheric pressure, pass it through a compressor to increase its pressure to that coming from the field traps which it will join upstream of the main compressor installations.

The absorption tower will be novel in design since it will be a combination of three plant units in one shell. The base of the tower will contain an inlet scrubber; the central section, a 16 plate bubble cap absorber; and the top section, an outlet scrubber. This feature makes possible a substantial saving in piping costs and results, as well, in a material saving of plant yard space.

The stabilizer circuit will be so arranged that only the amount of reflux required by the column is condensed; the excess being discarded to stack as a warm vapor. The entire plant will be automatic in operation after manual setting of the lean oil circulating rate. This will be accomplished by liquid level controls. Augmenting the automatic control feature of the plant, as well as to make it as fool-proof as possible, alarms with audible signals will be installed. These will include high-level alarms on the high- and low-pressure vent tanks, the scrubbers, low pressure on the lean oil discharge, the plant pilot supply system, the cooling water discharge with both high- and low-level alarm on the boilers.

The plant is being erected by Parkhill-Wade on a turnkey basis, ground having been broken November 12 and delivery is scheduled for early in January 1941.

Texaco Builds For 100 Octane

"Fighting grade," 100-octane gasoline demanded by the Army and Navy for their combat planes will soon be in production at the Los Angeles harbor refinery of The Texas Company of California, it was announced here today. New equipment to manufacture the fuel will be installed at a cost of nearly one million dollars and will probably be in operation by March 1, according to Torrey H. Webb, vice president and general manager of the California company, who made the announcement.

To produce this high-octane fuel at the rate of ten million gallons a year, Texaco will make use of a process known as "alkylation," a new method of obtaining the gasoline demanded by today's high-compression engines. The process has the further advantage of economizing on petroleum reserves, as it utilizes certain waste petroleum fractions which have hitherto escaped as burned gases in the refining process.

Blueprints of the new plant have been approved by L. R. Holmes, vice president in charge of refining here, and construction will begin immediately.

"When the new unit is completed, we expect it to be the most up-to-date refining unit of its kind on the Pacific Coast," said Mr. Holmes. "We are glad that in the process we can make this contribution to the national defense as well as to Los Angeles labor and construction totals."

The unit will have a daily capacity of 13,600 gallons of the alkylate concentrate. From this concentrate, with further processing and blending, it will be possible to provide ten million gallons of the "fighting grade" gasoline a year, This is enough fuel to keep a fleet of 102 attack bombers in the air for 500 hours

Fuel of this high octane rating not only gives fighting planes and bombers increased speed, but also provides them with greater climbing power and increased bomb carrying capacity as compared with gasolines formerly used.

An oil company is operating 40 service stations as training schools and sales laboratories for its dealers.

Cars travelling at 30 miles an hour can stop within 57 feet on anti-skid streets surfaced with dolomite, asphalt, and filler.

Synthetic Chemicals From Petroleum

Following Wake of Gasoline Development

By L. Rosenstein
Shell Chemical Co., San Francisco, Calif.

ABSTRACT

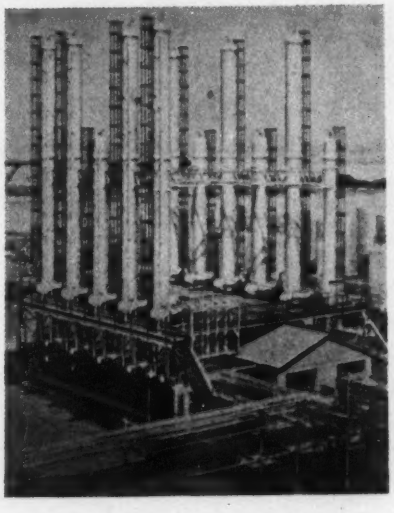
The manufacture of synthetic chemicals from petroleum and natural gas has been one of the major developments in the chemical industry during the past decade. As an example, Shell Chemical Company's production of ammonia has increased from 4,500 tons in 1931 to 27,000 tons in 1939; of solvents from 90,000 lbs. to 57,000,000 lbs. in the same period. A continually increasing variety of chemicals of exceptionally high purity is being made available at constantly decreasing cost, from cheap raw materials whose supply is stable, abundant, and remarkably adaptable. Alcohols, ketones, and esters made from refinery gases that formerly were used only as furnace fuel now are known quite well to chemical markets. Many new products, now produced on laboratory and pilot-plant scale by Shell Development Company, in due course will join them. Among these are unsaturated alcohols and chlorides, glycerol and its derivatives, and butadiene.

The entrance of the petroleum industry into the field of synthetic chemicals has had a profound influence upon the development of synthetic gasolines; thus the development of isooctane was associated closely with that of secondary butyl alcohol. Other similarly close relationships may be expected as petroleum chemicals play an increasingly important part in the economics of the industry.

The manufacture of synthetic chemicals from petroleum and from natural gas, closely related to it, is becoming a major American industry. Petroleum is well suited as a chemical raw material: it is cheap and abundant, and contains a wide variety of chemical types which, in themselves or after cracking to simpler compounds, may be converted to derivatives of many kinds. Several general reviews of this field recently have appeared[1,2,3,4]; the present paper will be be concerned largely with developments in which Shell Chemical Company has played some part. These developments are, however, typical of the petroleum chemical industry as a whole.

At the outset a word of explanation may be in order regarding the relation of Shell Chemical Company to its associates, Shell Oil Company, Inc., and Shell Development Company. By and large it may be said that Shell Chemical operates on raw materials which Shell Oil is in a position to furnish; and it uses processes and manufactures products which have been developed in the research laboratories and pilot plants of Shell Development. On behalf of Shell Chemical, the latter carries on extensive market research concurrently with its investigations of processing, to the end that applications may be found and markets developed for present and potential chemical products, and new products may be supplied to meet the expressed needs of industry.

Gas Reform Plant—Shell Chemical Company, Pittsburg, Calif.



Fractionating Columns—Shell Chemical Company, Dominguez, Calif.

In the synthetic-chemical field Shell Chemical Company has been active both in the synthesis of alcohols, ketones, etc., from refinery cracked gases, and in the manufacture of ammonia and related products from natural gas and atmospheric nitrogen. Commercial operations were begun in 1930 with the production of secondary butyl alcohol from butylene at Martinez, Calif.; and, within a year, the synthesis of ammonia at Shell Point, near Pittsburg, Calif. Expanding operations necessitated extension of the Martinez plant in 1933 to manufacture tertiary butyl alcohol and methyl ethyl ketone, and soon thereafter at the same location a plant was built to regenerate spent alcohol acid to make it usable in manufacturing ammonium sulfate. In 1936 a large alcohol and ketone plant was built at Dominguez, near Los Angeles; and this since has been enlarged to produce acetates and higher-boiling ketones. In the first year of commercial operation about 4,500 tons of ammonia and 90,000 lbs. of solvents were produced; in 1939 the corresponding figures were 27,000 tons and 57,000,000 lbs. About half of the ammonia produced is converted into ammonium sulfate; and in this connection it may be noted that means have been found to use acid sludge from petroleum refining for this conversion, without impairing the quality of the ammonium sulfate produced.

The manufacture of ammonia at Shell Point begins with the cracking of natural gas over a brick checkerwork, at an average temperature of 1,100 deg. C., yielding a gas containing 70 per cent of hydrogen, the rest being unconverted methane, with small amounts of nitrous oxide, carbon monoxide, carbon dioxide, benzene, ethylene acetylene, and naphthalene. Most of the carbon content of the natural gas is converted to the solid form; it is separated from the crude hydrogen by washing with water and by electrical precipitation. Nitrous oxide is removed from the hydrogen by passage over iron oxide; naphthalene and benzene by washing with oil; carbon dioxide by washing with water and alkali; and light hydrocarbon impurities (methane, ethylene, and acetylene) by low-temperature fractionation, in the last stage of which liquefied atmospheric nitrogen is introduced to aid in the removal of carbon monoxide by fractionation, and to form a nitrogen-hydrogen mixture in the molecular proportions of ammonia. In the synthesis plant the last traces of carbon monoxide and oxygen are removed, and the synthesis is effected under high pressure, the ammonia emerging as a gas ready for liquefaction or conversion into ammonium sulfate.

The principal application of ammonia is agricultural. When irrigation is practised, farmers use the ammonia as a fertilizer in liquefied form, when it is carried into the soil in highly dilute solution with the water. In the form of ammonium sulfate it is used on land prior to irrigation, or on non-irrigated land. Am-

[a] Figures refer to bibliography on p. 17.

TABLE 1
Properties of Pure Compounds

Compound and Chemical Formula	Molecular Weight	Specific Gravity (20/4 Deg C)	Boiling Point at 760 Mm Mercury (Deg C)	Melting Point (Deg C)	Vapor Pressure at 20 Deg C (Millimeters of Mercury)	Flash Point (Closed Cup) (Deg F)	Pounds Per Gallon at 20 Deg C	Solubility with Water (Per Cent by Weight at 20 Deg C)		Azeotrope with Water	
								Compound in Water	Water in Compound	Boiling Point (Deg C)	Per Cent by Weight of Compound
KETONES											
Acetone: $CH_3.CO.CH_3$	58.08	0.7898	56.1	− 95.0	186.2	5	6.59	Complete	Complete	....	....
Methyl ethyl ketone: $CH_3.CO.C_2H_5$	72.10	0.8047	79.6	− 86.4	71.2	25	6.72	27.0	12.5	73.4	88.7
Methyl *isobutyl* ketone: $CH_3.CO.CH_2.CH(CH_3)_2$	100.16	0.8004	115.9	− 83.5	15.2	60	6.68	1.7 (25 deg)	1.9 (25 deg)	87.9	75.7
Mesityl oxide: $CH_3.CO.CH:C(CH_3)_2$	98.14	0.8546	129.5	− 59	8.0	83	7.13	3.1	3.1	91.8	65.2
Diacetone alcohol: $CH_3.CO.CH_2.COH(CH_3)_2$	116.16	0.9384	166 (approximate)	− 47	0.84	144 (open cup)	7.83	Complete	Complete	98.8	12.7
ESTERS											
Isopropyl acetate: $CH_3.COO.CH(CH_3)_2$	102.13	0.8719	88.6	− 73.4	.....	39	7.28	2.9 (25 deg)	2.0 (25 deg)	76.6	89.4
Secondary butyl acetate: $CH_3.COO.CH(CH_3).C_2H_5$	116.16	0.8711	112.4	.....	16.2	64	7.27	...	...	87	77.5
ALCOHOLS											
Isopropyl alcohol: $CH_3.CHOH.CH_3$	60.09	0.7848	82.3	− 89.5	31.5	54	6.55	Complete	Complete	80.2	87.7
Secondary butyl alcohol: $CH_3.CHOH.C_2H_5$	74.12	0.8065	99.5	−114.7	12.1	73	6.73	24.4	56.0	87.5	72.7
Tertiary butyl alcohol: $(CH_3)_3.COH$	74.12	0.7791 (26 deg)	82.4	25.6	57.3 (30 deg)	48	6.50 (26 deg)	Complete	Complete	79.9	88.3
ETHERS											
Isopropyl ether: $(CH_3)_2.CH.O.CH(CH_3)_2$	102.16	0.7238	68.4	− 86.8	120.2	−6	6.04	1.0	0.5	62.2	95.5

TABLE 2
Derived Chemicals from Olefin by Chlorination

Name	Formula	Molecular Weight	Boiling Point (Deg C)	Specific Gravity (20/4 Deg C)	Flash Point* (Deg F)	Solubility in Water (Per Cent by Weight at 20 Deg C)
Allyl alcohol	$CH_2=CH-CH_2OH$	58.08	97	0.852	70	∞
Methallyl alcohol	$CH_2=C(CH_3)-CH_2OH$	72.10	114	0.852	90	20
Allyl chloride	$CH_2=CH-CH_2Cl$	76.53	45	0.937	−25	<0.1
Methallyl chloride	$CH_2=C(CH_3)-CH_2Cl$	90.56	72	0.926	10	<0.1
Isocrotyl chloride	$CH_3-C(Cl)=CHCl$	90.56	68	0.919	35	<0.1
1,2,3-trichloropropane	$CH_2Cl-CH-CH_2Cl$	147.45	156	1.391	170	<0.1
Diallyl ether	$CH_2=CH-CH_2-O-CH_2-CH=CH_2$	98.14	95	0.808	20	0.3
Dimethallyl ether	$CH_2=C(CH_3)-CH_2-O-CH_2-C(CH_3)=CH_2$	126.19	134	0.816	15	<0.1
Glycerol α-monochlorohydrin	$CH_2OH-CH(Cl)-CH_2Cl$	110.55	213	1.320	280	∞
Glycerol dichlorohydrin	$CH_2Cl-CH(OH)-CH_2OH$	128.99	182	1.362	200	13
Epichlorohydrin	$CH_2Cl-CH(O)-CH_2$	92.53	117	1.181	90	6

*—ASTM open cup.

monia is used also by large cities in the purification of water, in oil refineries as a neutralizing agent and corrosion preventative, and in cold-storage and ice-manufacturing equipment as a refrigerant. It is also a source of nitric acid for the manufacture of explosives, cellulose nitrate, etc.

The carbon which is left after the hydrogen has been removed from methane is processed further to meet the exacting requirements of the rubber industry. It has found wide acceptance as a soft carbon, such as is used in the compounding of rubber for hose, tubing, gaskets and mechanical goods. That part of the carbon not suitable for this trade is made into briquettes which, because of their very low ash content and nearly zero sulfur content, have been found useful in metallurgy, more especially in steel production.

The production of alcohols, ketones, etc., from cracked petroleum gases has grown steadily in the past two decades. Thus, according to Tariff Commission reports, 37,500 gals. of isopropyl alcohol were made via the sulfation of propylene in 1922, 1,500,000 gals. in 1931, and 27,500,000 gals. in 1939. During this period the price fell steadily from $2.00 per gallon to 31 cents per gallon.

The process used by Shell Chemical Company for the production of alcohols from olefins consists of:

a. Production of pure hydrocarbon fraction containing only the olefin and its corresponding paraffin.
b. Absorption of the olefin content in concentrated sulfuric acid to produce the alkyl hydrogen sulfates and dialkyl sulfates.
c. Separation of the products (b) from unreacted hydrocarbons.
d. Hydrolysis of the products (b) to either alcohols or ether in dilute sulfuric-acid solution.
e. Removal of alcohols and ethers from solutions (d) by distillation.
f. Subsequent purification of alcohols and ethers by fractionation.

In this way isopropyl alcohol and diisopropyl ether are made from propylene, secondary butyl alcohol from a- and b-butylenes, and tertiary butyl alcohol from isobutylene.

Acetone is made from isopropyl alcohol, and methyl ethyl ketone from secondary butyl alcohol, by catalytic dehydrogenation and subsequent fractionation.

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These two alcohols also are converted to the corresponding acetates by continuous esterification processes especially developed for this purpose.

From acetone a further series of products is made: diacetone alcohol by catalytic condensation of acetone at low temperature, and subsequent fractionation; mesityl oxide by the catalytic dehydration of diacetone alcohol; and methyl isobutyl ketone by the catalytic hydrogenation of mesityl oxide.

Physical properties of these products, all made on commercial scale by Shell Chemical Company, are listed in Table 1.

The principal uses of the alcohols, ketones, and esters are as solvents and extractants in the manufacture of lacquers, varnishes, and allied products, synthetic resins, plastics, synthetic fibers, artificial leather, safety glass, photographic films, printing inks, cosmetics, medicinal preparations, explosives, etc., and also in the dewaxing of mineral oils and extraction of vegetable and animal materials.

The alcohols and ketones have found extensive use as base material for chemical synthesis to make products such as esters, chlorides, ethers, xanthates, substituted hydrocarbons, fruit essences, perfumes, dyestuffs, wetting agents, and synthetic resins. Isopropyl alcohol, because of its complete miscibility with water, is used extensively as a component of antifreeze solutions for automobile radiators.

As a particular example of these olefin derivatives, let us consider methyl ethyl ketone—which until recently was available commercially only as a component of "light acetone oil," a by-product of the wood-distillation industry. This mixture was limited in quantity and of uncertain composition, and never found extensive industrial uses. Since the introduction of synthetic methyl ethyl ketone from petroleum, a pure product of uniformly high quality, it has been consumed in increasing quantities by a variety of industries. For instance, it is an excellent solvent for nitrocellulose, with good tolerance toward the other materials that are used in lacquer manufacture, and in many of its properties it excels the esters as a lacquer solvent. It is also an exceptionally good solvent for the highly polymerized vinyl-type resins. It is used as a paint remover, an extractant in various applications, and a dewaxing agent for mineral oil. It finds extensive use in the processing of cellulose-acetate plastics, in the synthesis of rubber chemicals, and in the manufacture of rotogravure and intaglio inks.

Besides these major products, scores of others are in various stages of development in the research laboratories and pilot plants of Shell Development Company at Emeryville. Many of these are produced on semi-commercial scale; among them are several unsaturated chlorides and alcohols and their derivatives made from propylene and the butylenes via substitutive chlorination,[5] followed by hydrolysis, chlorhydrination, etc.[3,6] A number of these products, with physical properties, are listed in Table 2. The first commercially practical synthesis of glycerol[7] was an outgrowth of these developments. This is now ready for full-scale application whenever economic conditions justify.

Also in the stage of semi-commercial development is butadiene, which is of growing interest in connection with the manufacture of synthetic rubber. Both Shell Chemical and Shell Development Companies have been active in this development for a number of years, and have for some time been supplying from the small-scale plant at Emeryville, Calif., several tons a week of butadiene to rubber manufacturers.

These are only illustrations of the possibilities of chemical products from petroleum; among the many developments not touched upon is the wide variety of products from ethylene, such as ethyl alcohol, glycol and glycol ethers, and derivatives of acetylene, whose production from methane and other hydrocarbon gases has been shown to be feasible.

In the manufacture of chemicals from cracked petroleum gases the pioneers in the industry had attempted to react fairly complex mixtures of the various olefinic starting materials. This resulted in a multiplicity of main and side reaction products, with attendant difficulties of separation and purification. An important advance in manufacturing technique has been the separation of the mixture of hydrocarbons before reaction into small groups, such as C_3 (propane and propylene) or C_4 (butane and the butylenes), and the rigorous exclusion of harmful impurities such as sulfur compounds.

Not only have yields been improved by this means, but the resulting products themselves are produced eventually in high purity and of the unquestionable uniformity which is necessary for their application in many industries. For example, acetone used in the manufacture of artificial silk must be free from even the minutest amounts of active sulfur compounds, i.e., such as would corrode the metal spinnerets, whose constancy of diameter controls the denier of the silk fiber. When we first proposed to make acetone from petroleum gases, the head of a leading artificial-silk company stated that it would be impossible to think of meeting his requirements in this particular direction. In solving this problem the research laboratory first had to devise analytical methods applicable in the range of interest, i.e., of the order of 1 to 5 parts of sulfur in 10 million parts of acetone. The technique of such measurements was so perfected that we now are able not only to measure a total sulfur impurity of less than 5 parts in 10 million, but also to say within a 10 percent error how much of that impurity is due to the presence of free sulfur, hydrogen sulfide, mercaptan, or other form of active sulfur.

By rigorous control of processing—including the purity of raw materials—guided throughout by such precise analytical procedures, acetone and other chemicals are produced regularly in a high state of purity. In fact, the high level of scientific standards and scientific control of manufacturing operations, which has been necessary in the petroleum chemical industry, has reflected to the benefit of the oil industry as a whole.

Moreover, important changes have been brought about in the fundamental economics of the oil industry, as a result

(Continued on Page 17)

Equilibrium Constants of the Light Hydro-

Carbons and Their Applications

By Frank West, The Texas Company

Presented before C.N.G.A. December, 1940 Monthly Meeting

1. Introduction

In the treatment of a vapor liquid equilibrium the ratio of the mol fraction of any component in the vapor phase to the mol fraction of the same component in the liquid phase is known as the equilibrium constant.

If; y = Mol fraction in the vapor phase.
x = Mol fraction in the liquid phase.
K = The equilibrium constant.
Then; $y/x = K$.

According to the combination of Raoult's and Dalton's Laws the value of K for any component is equal to the ratio of the vapor pressure of the pure component at the existing temperature to the total pressure on the system. This is expressed as follows:

$$K = P/\pi$$

Where; P = Vapor pressure of the pure component.
π = Total pressure on the system.

This expression is based upon the assumption that the partial vapor pressure of any component in the liquid phase is equal to the mol fraction of that component in the liquid times its vapor pressure in the pure state and also upon the assumption that the partial pressure of the same component in the vapor phase is equal to its mol fraction in the vapor times the total pressure. The first assumption may be considerably in error since the vapor pressure of any component in the liquid phase of a hydrocarbon mixture is not generally equal to its vapor pressure in the pure state but is dependent upon total pressure and composition of the mixture as well as upon temperature. The second assumption would be valid only if the vapors behaved as ideal gases. This is not the case with hydrocarbon vapors. It, therefore, follows that equilibrium constants determined from the expression

$$K = P/\pi$$

are quite unreliable, particularly when the equilibrium pressure is widely different from the vapor pressure of the component under consideration.

In order to correct for the principal errors introduced by the use of the Raoult-Dalton Law expression of equilibrium, Souders, Selheimer and Brown substituted fugacity of the liquid component for its vapor pressure "P" and fugacity of the vapor component for the total pressure

"π".

The expression then became:

$$K = f_L/f_v$$

Where; f_L = Fugacity of the pure component as liquid at the equilibrium temperature and total pressure.
f_v = Fugacity of the pure component as vapor at the equilibrium temperature and total pressure.
K = The equilibrium constant.

By the use of fugacities, corrections have been made for the effect of total pressure on the partial vapor pressure of the component in the liquid phase and corrections have been made for the effect of Boyles Law deviations on the partial pressure of the component in the vapor phase, but Brown and his coworkers based their findings on the assumption that both the liquid and vapor phases of the equilibrium mixture behaved approximately as ideal solutions. By experimental data, this assumption has been found in most cases to be greatly in error and equilibrium constants determined in this manner are not always dependable.

During the last several years sufficient experimental data have been developed, principally through the work of Sage and Lacey and Katz and Hachmuth, to show the definite effect of the composition of the mixture upon the equilibrium constants. This work has also shown that the constants developed to date are very limited in their accurate use and that before confidence can be placed in equilibrium computations a much greater un-

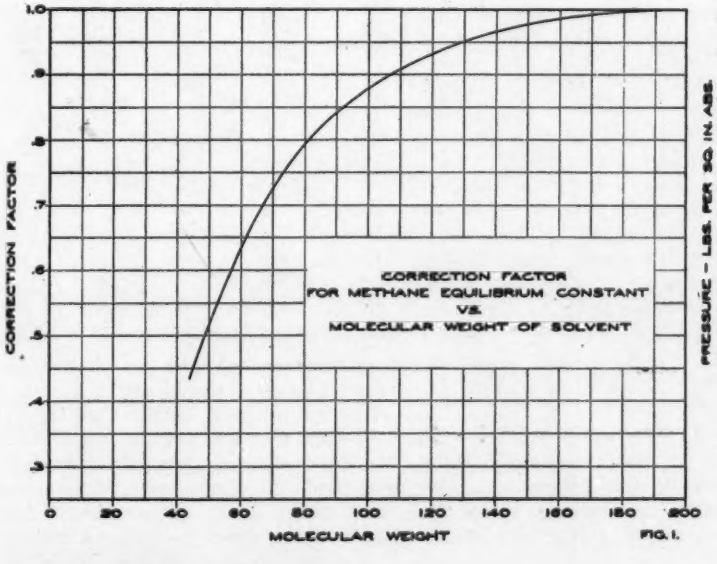

FIG. 1.

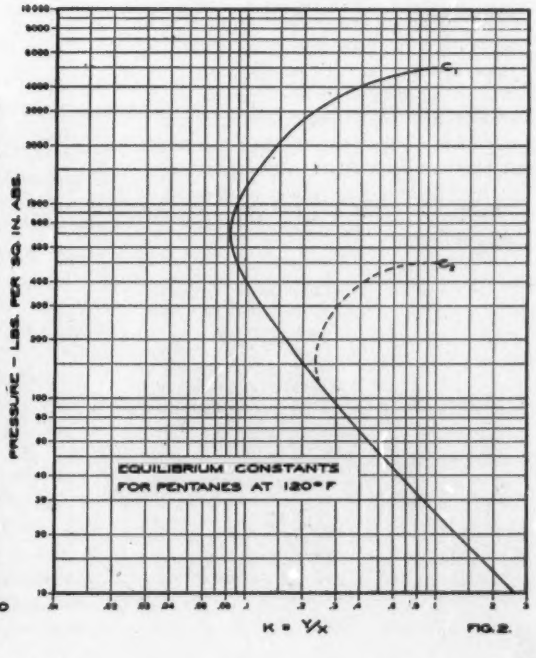

FIG. 2.

derstanding must be had in regards to their evaluation.

2. The Use of Equilibrium Constants

This paper will confine the use of equilibrium constants almost exclusively to vapor-liquid equilibrium computations within the gasoline plant. Accordingly a few of the most important applications will be briefly discussed.

The fundamental equation for determination of absorption oil rates is based upon the existence of an equilibrium in the bottom of the absorber. If the rich gas contains a certain number of mols of any component and a specific percentage of that component is absorbed by the oil then that quantity in the outgoing oil must be in equilibrium with the quantity in the gas.

Let; A = Percentage absorbed of the component under consideration.
V_1 = Mols of the component in the rich gas.
V = Total mols of rich gas.
L = Total mols of rich oil.
K = Equilibrium constant.

Then; $V_1/V = y$ = Mol fraction of component in rich gas.

And; $AV_1/L = x$ = Mol fraction of component in rich oil.

Also; $K = y/x$ (Equilibrium equation).

Therefore; $$K = \frac{V_1/V}{AV_1/L} = LV_1/AV_1V = L/AV$$

Or; $L = KAV$

This illustrates the use of the equilibrium constant for absorption oil rate determinations.

The fundamental equation for the steam rate to the rich oil stripper is developed in a like manner. If the entering rich oil contains a certain number of mols of any gasoline component and a specific percentage of that component is stripped out by the rising vapors then that quantity in the outgoing vapors is assumed to be in equilibrium with the quantity in the rich oil.

Let; S = Percentage stripped of component under consideration.
L_1 = Mols of that component in the rich oil.
L = Total mols of rich oil.
V = Total mols of vapors leaving the stripper.
K = Equilibrium constant.

Then; $L_1/L = x$ = Mol fraction of component entering with the rich oil.

And; $sL_1/V = y$ = Mol fraction of component in vapors leaving the stripper.

And; $K = y/x$ (Equilibrium equation).

Therefore; $$K = \frac{sL_1/V}{L_1/L} = LSL_1/L_1V = LS/V$$

Or; $V = LS/K$

This is the equation for the mols of vapor leaving the stripper necessary to strip a certain percentage of a specific component from the entering rich oil and again illustrates the use of the equilibrium constant.

Undoubtedly the most common usage of the equilibrium constant is for the direct computation of vapor-liquid equilibria as may occur with either equilibrium distillation or condensation, the equation for which is as follows:

$$V = \frac{K_1F_1}{\frac{L}{V}+K_1} + \frac{K_2F_2}{\frac{L}{V}+K_2} + \frac{K_3F_3}{\frac{L}{V}+K_3} + \text{etc.}$$

Where;
V = Total mols of vapor leaving the equilibrium.
L = Total mols of liquid leaving the equilibrium.
F_1 = Mols of component No. 1 entering the equilibrium system both vapor and liquid
K_1 = Equilibrium constant for Component No. 1.

This equation must be solved by trial and error. If the feed to the system is known in quantity and composition, the quantity and composition of both the vapor and liquid leaving the system may be computed at any given temperature and pressure by assuming a value for V. If by computation the summation of

$$\frac{K_1F_1}{\frac{L}{V}+K_1} + \frac{K_2F_2}{\frac{L}{V}+K_2} + \text{etc.}$$

does not equal the assumed value of V, a new assumption must be made and the equation again solved. This must be repeated until a check is made between the assumed value of V and the computed value. In so doing the mols of both vapor and liquid and the corresponding compositions have been found.

There are innumerable other computations that may be made by the use of the equilibrium constant such as dew points, bubble points, fractionator computations, condensation pressures and temperatures, etc., and it is easily understood that the accuracy of these computations is dependent almost entirely upon the accuracy of the value chosen for the equilibrium constant.

3. Equilibrium Constant Charts

Several of the investigators of equilibrium constant determinations have developed charts from their data giving the K value for several of the light hydrocarbons in relation to temperature and pressure. Some of these charts have been published. The best known are those of Brown, Katz and Sherwood. Sherwood's charts were developed by Sherwood, Taylor and Parker of the Massachusetts Institute of Technology and are more commonly called the M.I.T. charts. The Brown and M.I.T. charts have been based largely upon theoretical computations while those of Katz were made up exclusively from experimental data. The two former named charts are limited to maximum pressures of about 500 and 800 lbs. per sq. in. respectively whereas those of Katz take the equilibrium constant of each hydrocarbon to the critical pressure of the mixture on which the determinations were made. This pressure was found to be about 5000#/sq.in.

Comparison of the three charts show considerable variation in the values given, this being particularly true with the constants for Methane and Ethane. A number of these constants taken from each of the charts for methane, ethane and propane and at several different pressures and temperatures are listed below for the sake of comparison.

Methane

Temp. F.	Pressure sq.in.abs.	Brown	M.I.T.	Katz
70°	200#	9.0	11.5	16.5
200°	200#	11.0	22.0	20.5
70°	300#	5.9	7.9	11.3
200°	300#	7.4	15.0	14.5
70°	400#	4.7	6.0	8.8
200°	400#	5.8	11.3	10.0
70°	600#	3.5	4.2	6.2
200°	600#	4.4	7.8	7.0

Ethane

Temp. F.	Pressure sq.in.abs.	Brown	M.I.T.	Katz
70°	200#	2.65	2.15	2.50
200°	200#	4.90	5.50	5.60
70°	300#	1.82	1.55	1.78
200°	300#	3.25	3.80	3.85
70°	400#	1.44	1.21	1.39
200°	400#	2.60	2.90	2.96
70°	600#	1.04	.95	1.06
200°	600#	1.86	2.02	2.15

Propane

Temp. F.	Pressure sq.in.abs.	Brown	M.I.T.	Katz
40°	50#	1.70	1.55	1.50
120°	50#	4.30	4.00	4.50
40°	100#	.90	.85	.80
120°	100#	2.25	2.10	2.15
40°	200#	.53	.50	.46
120°	200#	1.28	1.15	1.20

It will be noted from the above data that there are some variations of over 100% between the Brown and M.I.T. values for methane and that the M.I.T. and Katz values compare more favorably with each other than the Brown and Katz values. It will be remembered that the Katz determinations were made from

experimental data only. The maximum variation in the values for ethane listed above is about 24%, these values showing a much greater consistency than those for methane. A still closer comparison is noted in the values given for propane and although no equilibrium constants have been listed for fractions heavier than propane the values given on each of the three charts mentioned are reasonably consistent.

4. Effect of Composition

The standard equilibrium chart gives the K values for each component in relation only to temperature and pressure, assuming that the effect of the other variables is negligible. As previously stated this assumption would probably not be far in error if the mixture followed the laws of an ideal solution. This, however, is generally not the case and a third variable, that of composition of the solution, has a considerable effect upon the value of the equilibrium constant. Fortunately this effect seems to be appreciable, under normal conditions of temperature, pressure and composition, only for the two lightest hydrocarbons, methane and ethane; the effect on methane being much greater than that on ethane.

Little is so far known as to the extent of the variation in K values depending upon the composition of the solvent and no consistent or practical method has been set forth in order to determine these values as a function of composition as well as temperature and pressure. However, it has been well established that the equilibrium constants of methane and ethane are least in value if using a paraffinic solvent and increase in value respectively for naphthenic and aromatic solvents. It follows, therefore, that the actual values are definitely dependent upon the ratio to each other of the paraffinic, naphthenic and aromatic compounds in the solvent. For this reason the equilibrium constant of either methane or ethane at a given temperature and pressure may be considerably different when dissolved in natural gasoline, which is largely paraffinic, than when dissolved in an absorption oil which may contain mostly naphthenic and aromatic compounds. It has also been found that a decrease in value of the equilibrium constant takes place as the molecular weight of the solvent is increased above about 200. The average decrease in constant value for methane between solvents of 200 molecular weight and 800 molecular weight appears to be from 50 to 60 percent. As the solvent is decreased in molecular weight below 200 the K value is also decreased indicating that the equilibrium constant for methane is greatest when dissolved in a solvent of about 200 molecular weight. This action may be partly accounted for by the fact that as the molecular weight of most naturally occuring hydrocarbon liquids is decreased below 200 that liquid is rapidly increasing in percentage of paraffinic fractions.

Several methods have been presented as a means of correcting the equilibrium constant depending upon the characteristics of the solvent. These methods are as follows:

1. Determination of a correction factor for the equilibrium constant of each hydrocarbon depending upon the mol fraction of that hydrocarbon present in the solvent.
2. Determination of a correction factor based entirely upon the molecular weight of the solvent.
3. Determination of a correction factor based upon the molecular weight and the specific gravity of the solvent.
4. Determination of a correction factor based upon the molecular weight, specific gravity and the viscosity of the solvent.

Of the four methods listed above for correcting the equilibrium constant in respect to composition there is little doubt but that the last named, that of taking into consideration the molecular weight, specific gravity and viscosity of the solvent will give the most accurate and consistent results. The unfortunate fact is that so little is known of the evaluated effect of these three physical characteristics of the solvent upon the equilibrium constant that an accurate correction factor cannot be determined. This is particularly true with light solvents of 200 molecular weight or less as are pre-

EQUILIBRIUM CONSTANTS FOR METHANE

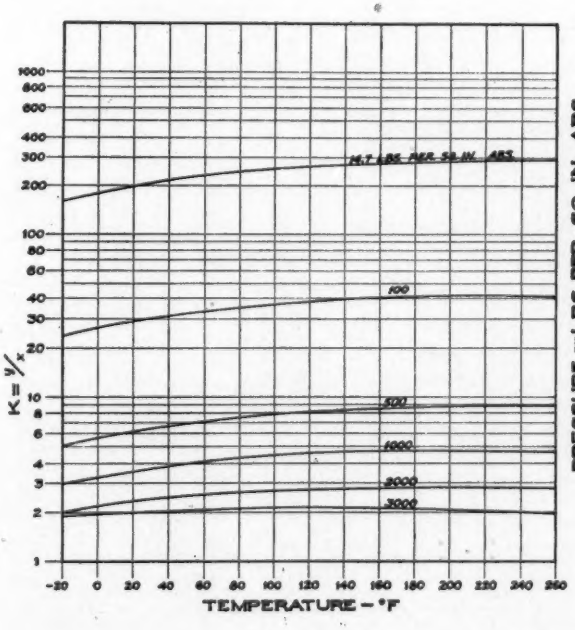

FIG. 3.

EQUILIBRIUM CONSTANTS FOR METHANE

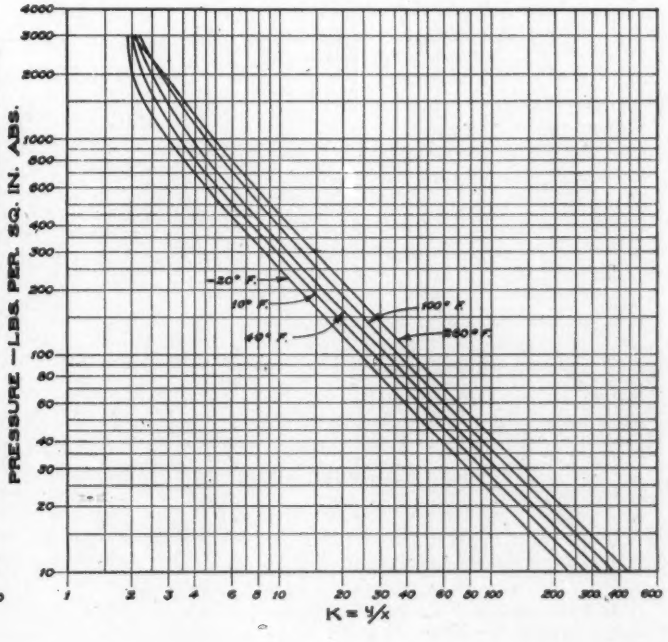

FIG. 4.

dominant in the natural gasoline plant.

A few equilibrium constants for methane, determined by experimental tests, at a temperature of 200°F. and a pressure of 200 lbs. per sq. in. abs., are listed below to show the variations that may be expected. The type solvent and name of investigator is given with each listing.

Value of "K"	Solvent	Investigator
15.8	Pentane	Lacey
18.0	Hexane	Lacey
20.9	38 A.P.I. Crude	Katz
17.0	29 A.P.I. Crystal Oil	Lacey
12.2	589 Mol. wt. Oil	Brown
9.1	744 Mol. wt. Oil	Brown

These data illustrate the fact that the high equilibrium constant value is found when using a solvent of about 200 molecular weight, comparable in this case to the 38 A.P.I. Crude oil and that the value decreases in both directions from this point. Figure 1 shows approximately the decrease in equilibrium constant value with a decrease in molecular weight below 200. This chart was made from the data of one investigator and was taken from the results obtained at one temperature and pressure. The correction factors shown may be somewhat in error at other temperatures and pressures and with solvents different in characteristics from those used by this investigator and, therefore, considerable caution should be assumed in the use of this chart.

5. Effect of the Critical State

A definition of the critical state is that state at which each of the intensive properties of the two phases become continuously identical. From this definition it is seen that the equilibrium constant for each of the components of the mixture must be unity at the critical point. At normal conditions of temperature and pressure the equilibrium constant decreases in value as the pressure increases. This can be seen to be the natural effect, as an increase in pressure causes

$$\frac{y}{x},$$

the ratio of the mol fraction in the vapor phase to the mol fraction in the liquid phase to become smaller. If the value

$$\frac{y}{x}$$

for any component is less than one, as is the case for all fractions heavier than methane at some condition of temperature and pressure, and since at constant temperature this value normally decreases with an increase of pressure it can be readily understood that at some pressure the equilibrium constant will change from a decreasing value to an increasing value so as to reach the unity line at the critical pressure. This point of change for any specific component may loosely be said to be the pressure at which retrograde phenomena starts to take place for that specific component. The pressure at which the smallest equilibrium constant value is found may be said to be the pressure of maximum concentration for that component in the liquid phase taking into consideration, of course, the temperature and composition of the mixture. This point is illustrated by Fig. 2.

The critical pressure of a mixture of two or more closely related hydrocarbons is found to be not far from, although it may be slightly in excess, of the critical pressure of any one of the components. A mixture of pentane and hexane with respective critical pressures of 485 and 435 lbs. per sq. in. abs., will have a maximum critical pressure of about 500 lbs. per sq. in. abs. However, with a mixture of widely separated fractions such as methane and a heavy crude oil the critical pressure may be in excess of 5000 lbs. per sq. in. In determining the equilibrium constants for the pentane existing in these two mixtures, assuming that some pentane is present in the heavy crude oil, two curves as shown in Figure 2 will be found. Both curves return to the constant value of unity at the critical pressure. The extreme error that may occur in the equilibrium constant value at a pressure of 300 to 400 lbs. per sq. in. is clearly illustrated by this figure. It also shows the necessity of knowing something in regards to the critical pressure of the mixture before a reasonable value can be given to the equilibrium constants of any of the components heavier than methane. As the critical pressure is approached a very rapid change in the K value takes place and consequently no confidence can be placed in values observed at a pressure close to the critical pressure of the mixture.

6. Construction of Charts

As previously stated the experimental data in regards to equilibrium constant determination are quite limited and any charts constructed from these data must be used with considerable caution. Un-

EQUILIBRIUM CONSTANTS FOR ETHANE

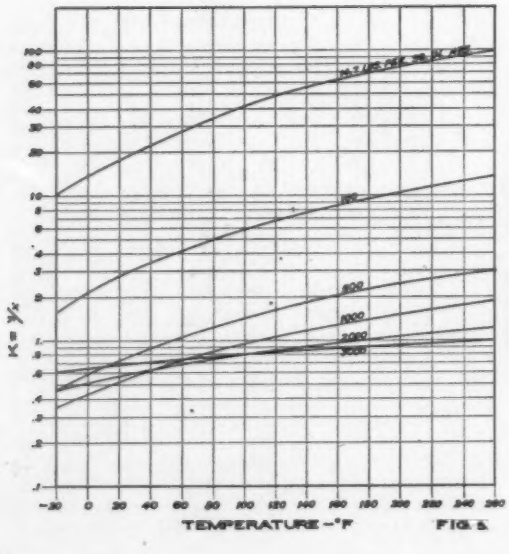

FIG. 5.

EQUILIBRIUM CONSTANTS FOR ETHANE

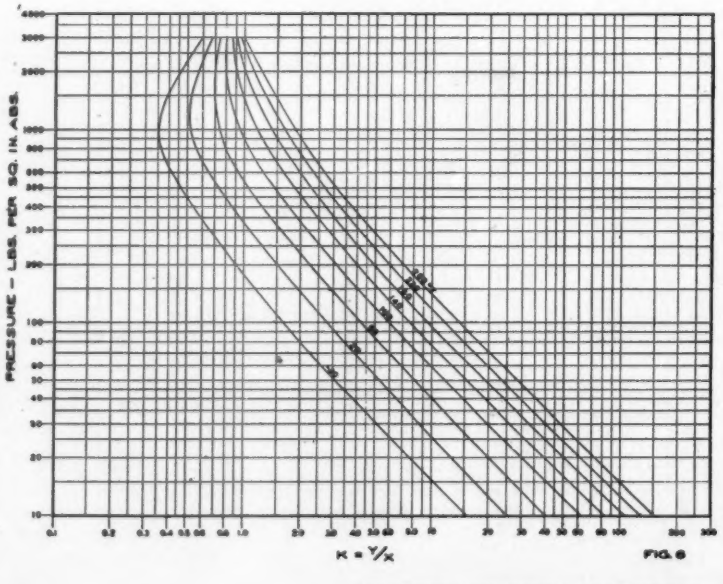

FIG. 6

doubtedly the best data that can be used for this purpose is that of Katz and Hachmuth published in the September, 1937, issue of INDUSTRIAL AND ENGINEERING CHEMISTRY. Equilibrium constant determinations were made on each of the light hydrocarbon fractions from methane to heptane inclusive, when using a Mid-Continent crude oil for each solvent of about 38 A.P.I. gravity. The values are given for each fraction at a number of pressures varying from atmosphere to 3400 lbs. per sq. in. and at three temperatures of 40° F, 120° F and 200° F. The critical pressure of the test mixture varied from about 4500 lbs. per sq. in. at 40° F. to 5000 lbs. per sq. in. at 200° F.

Figure 3 gives the K Values for methane plotted against temperature on constant pressure lines. Extrapolation of these lines was necessary at temperatures below 40°F. and above 200°F. which, of course, creates some doubt in regards to their accuracy outside the experimental temperature range. It will be noted, as shown by Figure 3, that a change in temperature above approximately 250°F. has little, if any effect upon the equilibrium constant of methane. This is a fact well to be remembered. From this chart points may be taken in order to construct the standard form of equilibrium chart illustrated by Figure 4, on which constant temperature lines are carried from a pressure of 10 lbs. per sq. in. abs. to 3000 lbs. per sq. in. abs. The higher pressure values are usable only if the critical pressure is well in excess of 3000 lbs per sq. in.

Figures 5 and 6 are similar charts constructed for ethane. The point of minimum K value is shown on Figure 6 for temperatures below 100°F. and at pressures ranging from about 1000 to 2400 lbs. per sq. in. abs. Extension of the constant temperature lines will intersect the unity K value line at the critical pressure.

Charts for propane and the heavier fractions may be constructed in the same manner. In addition to the data of Katz and Hachmuth there are other publications principally those of Sage, Lacey and coworkers giving much valuable data that should be used in the correlation of all data for the construction of these charts.

7. Conclusions

A study of the available experimental data in regards to equilibrium constant determinations leads one to conclusively believe that the subject is in its infancy and that much desired information must be had before these values can be used with confidence. There are, however, a few conclusions that can be presented at this time. They are as follows:

a. The equilibrium constant values taken from the charts constructed by Brown, M.I.T. and Katz for propane and heavier hydrocarbons can probably be used with reasonable accuracy in equilibrium computations within a temperature range from about 20°F. to 300°F. and at pressures not in excess of about 400 lbs. per sq. in. abs.

b. The equilibrium constant values taken from the charts mentioned above for propane and heavier hydrocarbons can probably be used with reasonable accuracy in equilibrium computations within a temperature range from about 20°F. to 300°F. and at any pressure shown by these charts under consideration that the critical pressure of the mixture is at least three times the equilibrium pressure.

c. Equilibrium constant values for ethane may be taken from any of the charts mentioned above, and under the temperature and pressure conditions listed for conclusions "a" and "b", with expected errors in their application ranging from nothing to a probable high of about 25%.

d. Equilibrium constant values for methane taken from these charts may be over 100% in error for the specific mixture under consideration.

e. The equilibrium values presented by Katz and Hachmuth for all the light hydrocarbons, and within the temperature and pressure range of their experimental tests may probably be used with reasonable accuracy if the equilibrium mixture is made up of a typical high pressure natural gas and a hydrocarbon solvent of about 200 molecular weight.

f. A practical study of the published data, both experimental and otherwise, and especially that of Sage and Lacey and their coworkers, should be made in order for one to make an intelligent application of equilibrium constants.

g. There is at present much to be desired in the way of experimental data in regards to equilibrium constants, but with a continuation of the progress made in this respect during the last few years a more complete knowledge of the subject is to be expected in the near future, at which time greater accuracy may be used in their evaluation.

Synthetic Chemicals From Petroleum

(Continued from Page 12)

of its entrance into the field of synthetic chemicals. Thus the guiding principle of Shell Chemical Company's first operations was to utilize refinery gases that otherwise would go to waste or, at most, be consumed as fuel. It would have been difficult to foresee the revolution in gasoline manufacture which was to come about as a result of one of the steps in secondary-butyl-alcohol synthesis — the step which consisted in removal of the isobutylene content of the feed by absorption in cold sulfuric acid, and recovery of the acid by heating, which polymerized the isobutylene to diisobutylene, the source of isooctane.

With the recognition of the possibilities of isooctane in aviation fuel came the development of the process as a refinery operation; and it soon became a question not of finding outlets for waste products, but of supplying enough raw materials for the needs in both chemical and synthetic-gasoline fields. This has led to the development, on the one hand, of the hot-acid polymerization process and the alkylation process, which utilize a greater proportion of the available hydrocarbon feeds; and, on the other hand, of processes for increasing the supplies of the key hydrocarbons.

Although prediction of future trends in the oil industry must be hazardous, there is no question but that chemical manufacture will play an increasingly important role. In some instances there actually may be a reversal of the original position, i.e., the refinery may be utilizing by-products of the chemical factory, and not the factory the by-products of the refinery. In any case, a close relationship may be expected as the operations of both expand into new fields.

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Long Beach Sells Harbor Land to Navy

City of Long Beach on Dec. 17 sold 105 acres of Terminal Island to the Federal government to develop for a naval base. The city sold the property for $1, but withheld the oil rights. The judgment, granted in United States District Court, ended one phase of the condemnation suit filed last August against Long Beach, the city of Los Angeles, the county of Los Angeles, the State of California, and other defendants to gain title to the land and expedite progress of the $40,000,000 development program. A stipulation provided that the government shall be accorded all except oil rights in the Long Beach property for the payment of $1. The suit was filed as what Navy officials hoped to be the final chapter in the long effort to obtain title to Reeves Field and to establish the government's right to take tidelands without compensation for use in improving navigation and to further the national defense program.

Proceedings for Calculating the Reid Vapor Pressure of Stabilized Natural Gasoline

By D. B. Johns

Standard Oil Company of California, Natural Gasoline Research Division.

Presented before C.N.G.A. December, 1940 Monthly Meeting

In technical work it is frequently necessary to convert composition data into terms of Reid vapor pressure values. In such cases, straight vapor pressure-molal relations are usually employed to compute a so-called "true" vapor pressure. A conversion factor is then applied to compensate for the fact that Reid pressures are somewhat lower than "true" values due to the loss of volatile fractions in the vapor space in the Reid apparatus. Insofar as "true" to Reid conversion factors are concerned, no widely accepted data have been issued. Curves are in use, however, which are based on the general assumption that these conversion factors bear a consistent relation to the vapor pressure of the gasoline without regard to composition.

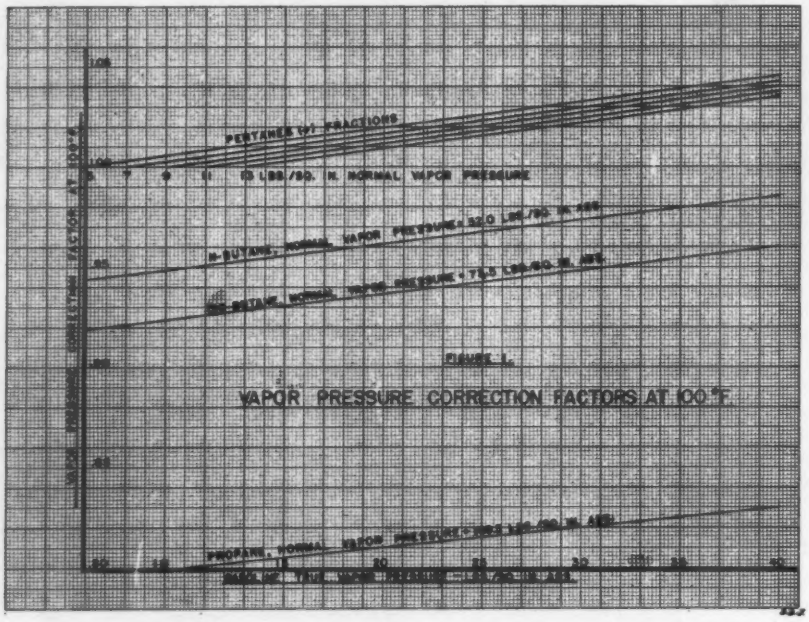

FIGURE 1.

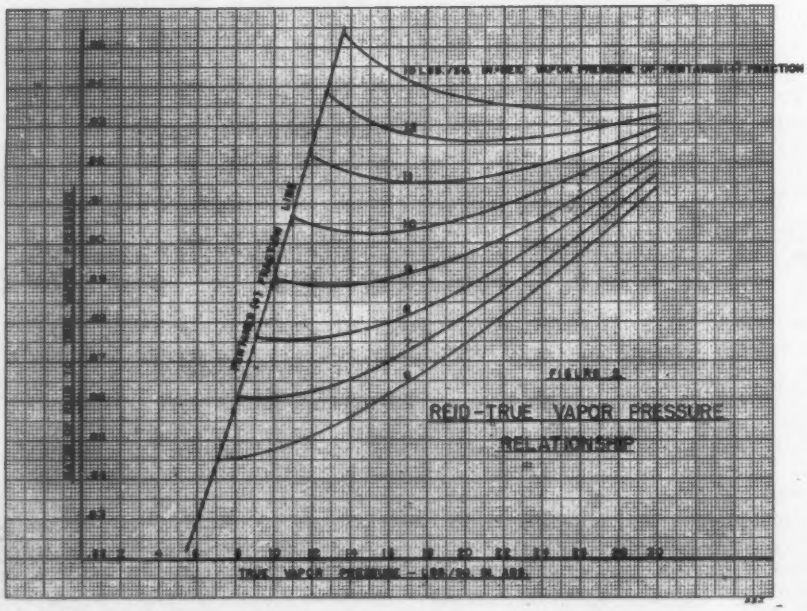

FIGURE 2.

The procedure for calculating Reid vapor pressures of stabilized natural gasolines which is described in this paper improves upon the above method in two respects:

1. It provides for application of fugacity relations in the calculation of "true" vapor pressures.

2. It provides "true" vs. Reid vapor pressure conversion factors which are a function of the composition as well as the vapor pressure of the gasoline.

Fugacity: Factors for calculating the fugacities of the components of natural gasoline are shown in Figure 1. These are expressed as 100° F. vapor pressure correction factors for the individual fractions (i.e., pentanes (+), normal butanes, etc.) in a typical natural gasoline, and were derived from a paper by Mr. R. B. Bowman on "Properties of Paraffin Hydrocarbons at High Pressures" which was presented to the California Natural Gasoline Association in May, 1938. It is recognized that these factors deviate to a certain extent with variations in gasoline composition, but average values are entirely satisfactory for the present purpose considering the low pressures involved.

The effect of application of fugacity is to lower calculated "true" vapor pressures from 0.5 to 1.0#/sq. in. The reliability of this method is substantiated by the fact that vapor pressures determined with a "true" vapor pressure apparatus, such as was described by Mr. E. J. Squire in a paper presented to C.N.G.A. in December, 1930, are in close agreement with values calculated on the basis of the fugacity data.

Conversion Factors: It has been found that "true" to Reid vapor pressure conversion factors are a function of pentanes (+) characteristics as well as gasoline vapor pressure. That is, application of a curve based on vapor pressure alone will give erroneous results. The conversion factor curves, which are shown in Figure 2, were established by experimental data on:

1. Pentanes (+) base stocks obtained from gasolines produced in most of the California fields.

2. Synthetic blends of butanes with two pentanes (+) base stocks having Reid vapor pressures of about 9#/sq. in. and 11.5#/sq. in., respectively.

The curves in Figure 2, which show the relationship between Reid and "true" vapor pressures of gasolines formed by the addition of butanes to the pentanes (+) bases, were obtained by interpolation and extrapolation of the blend data. These lines converge toward a point corresponding to the mixture of butanes assumed to be added to pentanes (+) base stocks to obtain higher vapor pressure gasolines. With reference to the curvature of the lines for the higher vapor pressure base stocks, it is evident that as the mixture of pentanes and heavier fractions more nearly approaches a single component (pentane), the ratio of Reid to "true" vapor pressures more nearly approaches unity. The addition of butane first exerts an appreciable lowering of the ratio which then increases again as the composite material approaches a mixture of butanes alone.

The magnitude of the error involved in failure to compensate conversion factors for composition is evident from inspection of Figure 2. A gasoline having a 22#/sq. in. "true" vapor pressure and an 8# Reid base would have a conversion factor of 0.894 and a Reid of 19.7, whereas a second gasoline having a corresponding 22#/sq. in. "true" vapor pressure but a 12# base would have a conversion factor of 0.926 and a Reid of 20.4#/sq. in., i.e., a difference of 0.7#/sq. in.

It is evident that the use of Figure 2 for calculating Reid vapor pressures requires information regarding properties of pentanes (+) fractions of natural gasolines which is not always available. Accordingly, a correlation has been made between A.P.I. gravity (which is easily obtainable on fraction residues) and the equivalent volume and Reid vapor pressure of the pentanes (+) fractions. These relationships are shown in Figure 3 and are based on the experimental data plotted therein. In general, the departure of specific data from the average curves is not large; however, when extreme accuracy in calculated Reid values is desired, it is preferable to utilize determined data on pentanes (+) base stocks.

Example Calculation

An example calculation is presented for the purpose of standardizing the computation so that different individuals will obtain comparable results with the same data.

Tabulate Data

1. Tabulate the analysis of the gasoline and the properties of the pentanes (+) fraction. For example:

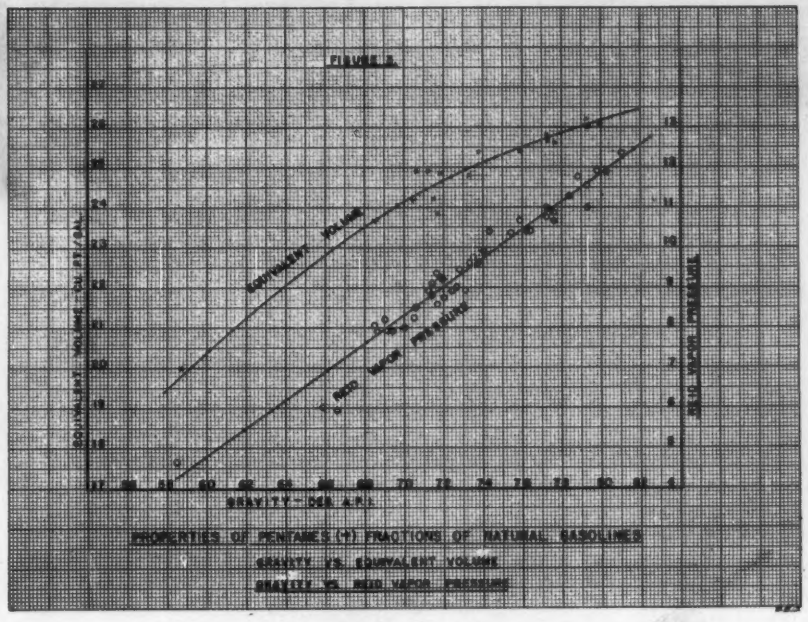
FIGURE 3.
EQUIVALENT VOLUME
REID VAPOR PRESSURE
GRAVITY - DEG. A.P.I.
PROPERTIES OF PENTANES (+) FRACTIONS OF NATURAL GASOLINES
GRAVITY VS. EQUIVALENT VOLUME
GRAVITY VS. REID VAPOR PRESSURE

FIGURE 4

EXAMPLE CALCULATION OF REID VAPOR PRESSURE OF NATURAL GASOLINE

A. BASIC DATA:

Composition:		Pentanes(+) Properties of Gasoline		
Isobutane	3.06% (liq.)	Gravity	71.6°A.P.I.	(Determined)
N-butane.	25.64	Equiv.Volume	24.6 Cu.ft/Gal.	(Figure 3)
Pentanes(+)	71.30	Reid V.P.	8.9 Lbs/Sq.In.	(Figure 3)
	100.00	True V.P.(100°F.)	10.0 Lbs/Sq.In.	(Figure 2)

B. CALCULATION OF UNCORRECTED TRUE VAPOR PRESSURE:

	1 Liq. %	x	2 Cu.Ft/Gal.	=	3 Cu.Ft/100 Gal.	4 Mol.Fract.	x	5 Norm.V.P. (100°F.)	=	6 Uncorrected True V.P.
Isobutane	3.06	x	30.7	=	93.9	.0352	x	73.5	=	2.59
N-butane	25.64		31.8		815.4	.3062		52.0		15.92
Pentanes(+)	71.30		24.6		1754.0	.6586		10.0		6.59
	100.00				2663.3	1.0000				25.10#/Sq.In. Abs.

C. CALCULATION OF CORRECTED TRUE VAPOR PRESSURE:

	4 Mol.Fraction	x	5 Normal V.P. (100°F.)	x	7 V.P. Corr.Factor @ 24.99#/Sq.In.	=	8 Corrected True V.P.
Isobutane	.0352	x	73.5	x	0.965	=	2.44
N-butane	.3062		52.0		0.968		15.41
Pentanes(+)	.6586		10.0		1.020		6.72
	1.0000						24.57#/Sq.In.Abs.

D. CONVERSION TO REID VAPOR PRESSURE:

Figure 2 indicates the ratio of Reid to true vapor pressure for 24.57# vapor pressure gasoline having 8.9# Reid pentanes(+) base = .907

Reid V.P. = 24.57 x .907 = 22.3#/Sq.In.

Composition—Liq. Vol. %		Pentanes (+) Properties		
Isobutane	3.06	Gravity	71.6° A.P.I.	(Determined)
N-butane	25.64	Equiv. Volume	24.6 Cu.ft/Gal.	(Fig. 3)
Pentanes (+)	71.30	Reid V.P.	8.9#/sq. in.	(Fig. 3)
	100.00	True V.P.@100° F.	10.0#/sq. in.	(Fig. 2)

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Uncorrected True Vapor Pressure

2. From the gasoline composition, converted to a molal basis, compute the "true" vapor pressure at 100° F. This calculation for the above example would be as follows:

1 Composition Liq. Vol. %		2 Cu.Ft/ Gal.	3 Cu.Ft/ = 100 Gal.	4 Mol Fract.	5 Normal × V.P.	6 Uncorr. True = V.P. (100° F.)
Isobutane	3.06	× 30.7[a]	93.9	.0352	73.5[b]	2.59
N-butane	25.64	31.8[a]	815.4	.3062	52.0[b]	15.92
Pentanes(+)	71.30	24.6	1754.0	.6586	10.0	6.59
	100.00		2663.3	1.0000		25.10/#sq.in.abs

[a] Vapor equivalents (perfect gas basis, 760 mm., 60° F.) of iso and normal butanes.
[b] Normal vapor pressure of iso and normal butanes (Figure 1).

Corrected True Vapor Pressure

3. Column 6 gives the uncorrected "true" vapor pressure. This should now be corrected by applying vapor pressure correction factors obtained from Figure 1. Since these correction factors depend upon the corrected vapor pressure, an exact calculation would involve a trial and error procedure However, for practical purposes, it is satisfactory to read the correction factor from Figure 1 at the uncorrected pressure obtained above. This is illustrated as follows:

4 Mol Fraction		5 Normal × V.P.	7 Corr. Factor × 25.10#/Sq.In.	8 Corr. True V.P. = @100° F.
Isobutane	.0352	73.5	.943	2.44
N-butane	.3062	52.0	.968	15.41
Pentanes (+)	.6586	10.0	1.020	6.72
	1.0000			24.57#/sq.in.abs.

Conversion to a Reid Basis

4. The final step is to convert the computed "true" vapor pressure obtained in step (3) to a Reid basis by means of Figure 2.

In the example, a gasoline having a "true" vapor pressure of 24.57#/sq. in. and containing an 8.9# Reid vapor pressure pentanes (+) fraction has a ratio of Reid to "true" of 0.907. Hence:

Reid V.P.=24.57x0.907=22.3#/sq. in.

Limitations

This method of calculating Reid vapor pressures has been found to be quite accurate when analysis data are correct and it is applied to rectified gasolines having vapor pressures up to 26#/sq. in. Reid and containing only small amounts of propane. Above 26#/sq. in. Reid the air-contacted test does not apply and it is known that a different Reid—"true" vapor pressure relationship exists for gasolines containing appreciable amounts of propane. It is hoped that this relationship may be presented at a later date.

Californians Head A.P.I. Topical Groups

Californians have been named to the national chairmanship of the A.P.I. topical committees. R. W. French, Continental Oil Co., has been named national chairman of the Topical Committee on Production Practice for 1941, and Stender Sweeney, Richfield Oil Corp., will be national chairman of the Topical Committee on Drilling Practice. They will play large parts in the preparation for the technical sessions at the annual meeting of the A.P.I. in San Francisco next November. E. W. Webb, Continental Oil Co., will be chairman of the California Topical Committee on Drilling Practice, and D. H. Acres, Richfield Oil Corp., will be chairman of the California Topical Committee on Production Practice for the coming year. The local topical committees hold monthly meetings on technical subjects.

Oil Industry Produced Toluene in World War I

While much has been said recently about the production of toluene, TNT ingredient, from petroleum, it is not generally known that the product has been produced from petroleum commercially at least as early as 1914. During the World War at least one company in California produced toluene from petroleum. The new Shell Oil Co. plant in Houston, Texas, however, is the first plant to be built primarily for toluene production from petroleum, and it employs an entirely new process, which was developed by Shell engineers. The new plant will produce over 2,000,000 gallons of toluene annually, from which it is possible to produce about 20,000,000 lbs. of TNT.

You are reading the Pacific Coast oil men's home paper.

Development of Continuous Logging

at Rotary Drilling Wells

Concluded from 1 Issue December

By J. T. Hayward
Barnsdall Research Corp.

The lower instrument on the central panel is the salt-water detector. Electrodes placed in the flow line and in the pump suction measure the electrical resistance of the in-going and out-going drilling mud. Inasmuch as the electrical resistance of the drilling mud varies greatly with temperature, automatic temperature compensation is incorporated in the electrodes and in the bridge circuit. The electrodes are tubular in form, the measuring current being confined to the interior of the tube, so as to be unaffected by external conditions such as the proximity of the walls of the flow line or pump suction. Because the mud is by no means homogenous, and the resistance of the stream continuously varies due to the addition of makeup water, etc., it is necessary to compare the resistance of an increment of the stream as it enters the well with the same increment as it issues. This is done by superimposing the input-resistance log on the output-resistance log, with the proper phase displacement between them to allow for the lag. Lack of congruity in the superimposed curves on the log indicates changes caused by the passage of the mud through the drilling zone. For reasons previously stated, the detection of a salt-water sand requires that the fluid phase of the mud be comparatively fresh. In the trailer installations completed up to the present, the salt-water detector is not connected to the recorder.

The detection of oil is made by exposing a sample of the mud to ultraviolet light in the viewing box. It consists of a light-viewing box containing a source of ultraviolet light and an alternate source of visible light. A magnifier is incorporated in the eye piece, and greatly assists the observations. A sample of mud is diluted with water, a viscosity and emulsion breaker added, and the sample placed in a 3-in. diameter dish, which is inserted in the viewing box. Under ultraviolet light oil fluoresces; but when present in the mud it does not show up as a fluorescent film, as might be expected, but as a number of bright specks on a dark background, the appearance resembling a starry sky. Originally it was anticipated that a show once picked up would go around through the pits, pumps, and hole, and reappear; but little trouble has been experienced owing to this cause, the fluorescence due to the crude oil usually disappearing after the first trip. Occasionally it may reappear, but on a second trip the fluorescence is much dimmer and easily is distinguished by an experienced operator. Lubricating oil, which also fluorescences and which may drip into the mud from the rotary or run down from the swivel, gives rise to the chief operating difficulty. It often can be distinguished by the slightly different color (from most crude oils) with which it fluoresces; and, in any case, with a little trouble it can be kept out of the mud stream. Recently special non-fluorescent lube oils have been developed and made available for use when contamination is troublesome.

If the mud samples for the mud observations merely are grabbed from the mud stream, erratic results are obtained—probably because the rate at which the bit is fed down during normal drilling is far from constant. To overcome this difficulty a continuous sampler is employed in the ditch. The wheel of the sampler is turned by the flowing mud, and at each revolution a small sample is picked up and deposited in the container.

The instrument above the salt-water detector on the center panel is the drilling-mud meter and pump-cycle-rate indicator. Switches mounted on the slush pump transmit electrical impulses to this instrument. The rate at which the pump is running is indicated continuously, on the large dial in the center of the panel, while the two counters, on the right and left, number the cycles. These two counters run in step, but one of them continuously leads the other by the number of cycles required to bring an increment of the circulating fluid from the bit to the top of the hole, this lead being determined experimentally, as previously described. For example, suppose that the depth of the well is 6,000 ft. The operator notes the reading on the leading counter, which is, say, "500," and enters it alongside 6,000 ft. He repeats this operation again when the depth is, say, 6,002 ft., and finds, say, "1,000" on the counter. Inasmuch as the one counter leads the other by the number of cycles required to bring the sample to the surface, the operator knows that the sample relative to the drilling between 6,000 ft. and 6,002 ft. will be arriving at the surface while the lagging counter reads from 500 to 1,000. Logging in this manner, of course, requires considerable attention on the part of the operator; but it is now no longer necessary because the recorder performs the operation entirely automatically.

The rate at which the pump runs is indicated continuously on the large dial of the instrument, in cycles per minute, and this indication has proved to have an important use unconnected with logging—which use is that on steam-driven rigs it gives an almost infallible warning of drill-pipe washouts before they have become serious enough to cause parting of the string. When a washout starts, the pump rate commences to increase, and continues to increase over a period of several hours until pipe failure occurs. This speeding up is almost imperceptible to the driller, as it occurs so slowly; but it easily is noticed on the meter which, in addition to its indicating pointer, is provided with a hand that is manually set to the normal pump speed a few minutes after the pump has been started and has settled down. Speed changes due to variations in boiler pressure easily are distinguished from those due to an incipient washout, being up and down and of small amplitude, whereas the change due to a washout is a steady increase.

The instrument at the top of the right-hand panel is the drilling-rate meter, or sclerograph. It is designed to compute a continuous running average of the drilling speed over a predetermined drilling distance. This method of averaging has been found to be desirable (for reasons discussed in a previous paragraph). Four rate scales are available, the operator selecting the scale most suitable to cover the drilling-rate range at a particular well by means of the control switch in the center of the panel. The dial continuously indicates the drilling rate, and the instrument is connected to the recorder, so that a continuous record of the rate is made.

The recorder is situated on the lower part of the right-hand panel. It is of the multiple-trace type. The chart is driven longitudinally by the depth recorder, either 1 in. to 20 ft., or 1 in. to 50 ft. The drive is fully automatic, the chart does not back up when the bit is lifted off bottom to ream, and the addition or subtraction of joints of drill pipe is taken care of by the drive without any attention.

Four parameters are recorded according to the present chart setup. Reading from left to right the first trace is the slush-pump rates, in cycles per minute; the second is drilling rate; the series of lines in the third column is drawn by the pump-stroke counter; and the fourth trace shows the gas. The lines in the third column serve to relate a gas show to the depth from which it came. A dial on the pump-stroke counter is set to the number of pump cycles experimentally determined as required to bring a sample from the bit to the surface. The pump-

stroke counter then causes the pen to move completely across the third column on the chart while this number of cycles is being performed, and continuously to repeat this operation.

Referring to this chart, an increment of the circulating fluid which passed the bit (at **A** on the chart), when the depth of the well was 6,043 ft., arrived at the surface (**B** on the chart) when the depth of the well was 6,050 ft. The gas show which appeared at **C** (opposite **B**), therefore came from 6,043 ft. There was another which commenced at **D** when the depth of the well was 6,128 ft., and the dashed line on the chart demonstrates the manner in which the depth at which this gas was encountered in the well is determined, viz., 6,089 ft.

When the indication of the gas indicator exceeds a predetermined value (in the present case 35 per cent), the symbols used for the gas curve and the "cycles in the hole curve" automatically are interchanged, as at **F** and **G**. This assists the interpretation of the log at such times as when drilling has been suspended while circulation is continued.

Conclusion

The trailers and service now have been commercially available a little more than a year, and have been used on approximately 200 wells. In addition to logging, at present the trailers are equipped for routine drilling-mud control and for core analysis. The development is in the early stages, and it is expected that other functions connected with the logging and operation of drilling wells will be added as time goes on.

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†"Fluid" is used in its wider sense, to cover gases as well as liquids.

Purchasing Personnel-ities

BANKLINE OIL COMPANY

By Leo S. Busby,
Associate Editor,
Southwest Purchasing Agent.

Time was when the mention of a purchasing agent conjured up in the public mind the picture of a stern, hard-visaged individual, beyond middle-age, with overhanging, shaggy eyebrows and square, arrogant jaw, who delighted in terminating every interview with an ear-splitting, desk-banging "No!"

But times have changed, and nowhere is this better exemplified than in the purchasing agent's office of the Bankline Oil Company, near Fifth and Hill Streets in Los Angeles. Bob Boroff is surprisingly youthful for so responsible a position. He boasts no shaggy eyebrows, and his jaw has no Mussolini bluntness. Neither does he sport a long, black Russian beard, as the last syllable of his name might suggest. He is a quiet, rather reticent individual, dark complexioned and good-looking. His straightforward way of looking at you together with his almost shy manner as he answers your somewhat personal questions, makes you feel that here is a chap it might be very pleasant to hoist a few with.

R. C. Boroff

Bob Boroff was born in Ohio City, Ohio, in 1910, and was immediately greeted by the loud beating of drums and the colorful waving of flags. It was Decoration Day. The grade and high schools of his home town furnished him his education, and in 1929 he forsook the comforts of that fair city for a visit —only a visit, mind you—to California. Like many another of us, Bob is still visiting.

Shortly after his arrival in this haven of the restless, Bob went to work for the Lovell Gasoline Company in the "gang" at Maricopa. The following year Lovell gave way to the Norwalk Company, and in no time at all, R. C. Boroff was the name of a clerk in the office. In 1937, Norwalk surrendered its equity in its promising young clerk, and shipped him to its affiliate, the Bankline Company in Los Angeles. Here he became assistant to John Penn, purchasing agent. Six months later, upon the resignation of Mr. Penn, Bob Boroff was stepped up into the vacancy.

Bob is married, and lives in one of those brand new, ultra-modern F.H.A. homes out in the Montebello Park district. When he's not spending his weekends fishing, he puts in his time keeping the lawn and gardens looking spic and span. Aside from fishing and gardening, Bob is an ardent devotee of ten-pins, and participates in a number of bowling tournaments during the year.

In the natural course of events, every P.A. is entitled to at least one assistant, and in John "Cecil" Healy, Bob Boroff has a natural. John Healy was born in Rawlins, Wyoming, on the last day of the eighth month of the next to the last year of the last century—or, to you, August 31, 1899. Somewhere along the line he picked up the nickname "Cecil," and all the king's horses and all the king's men couldn't drag out of him the circumstances.

John came to California—also on a visit —in 1922, and actually returned to Rawlins after only six months here. But when the first snow fell the following year and he saw that the white stuff on his coat collar was cold and wet, John hopped a west-bound rattler.

From 1923 to 1925 he worked in the Vernon Refinery of the General Petroleum Corporation, and then transferred his affections to the Bankline Refinery at Signal Hill. Here he toiled until 1929 when he was sent to the Los Angeles office as clerk. Six years later, in 1935, he again went traveling, this time to work in the bulk plant of the Norwalk Company at Fresno. Two years of that, and then back again to Bankline at Los Angeles, this time as assistant to Bob Boroff, in the purchasing department.

John lives in Los Angeles, and spends much of his spare time on the live-bait boats feeding sardines to scrappy yellowtails. Once in a while he hooks one, and true to his Irish ancestry, he spits on his hands, and gives the "divil" his due.

November Auto Sales Reach Peak Level

Factory sales of 514,500 cars and trucks in November were the highest for any month since June 1937, according to an estimate by the Automobile Manufacturers Association. Although only a fraction higher than October, which recorded sales of 514,374 vehicles, the November total boosted the 11 month total for 1940 to 4,188,934, 28 per cent above the corresponding period of 1939. November sales were 39.6 per cent above the same month a year ago.

The amount of gasoline produced from a barrel of crude oil in 1914 was about 18 per cent. Today, the average yield is 45 per cent. Yields as high as 70 to 75 per cent can be obtained in modern refineries.

Field Development

Los Angeles Basin

Fullerton Shuts-In East Whittier Well

Fullerton Oil Co.'s No. 6, which recently discovered new production a mile southeast of the old Whittier field, is now standing shut-in after a series of tests showed the high pressure gas in the upper perforated interval from 2195 to 2350 ft. Because the packer between the zones leaked, first reports were to the effect that the 8,000,000 cu. ft. gas flow came from the lower perforations from 2720 to 2940 ft. With the packer reset and the Otis choke in the tubing closed, the lower zone flowed at the rate of 35 bbls. of 20 gravity oil cutting 15.0%.

Although the full significance of the discovery is not fully understood, it can safely be said that a new commercial field has been found. As the flow was restricted by a small bean during the test of the gas zone it is assumed that actual capacity is much more than 8,000,000 cu. ft. On behalf of the deeper sand, it must be recalled that but little effort was made to clean the perforations and that a little more "babying" might greatly increase the flow. At any rate a well which flows 35 bbls. by itself should do a lot more on the pump. During the short time which it flowed, the water and mud content grew less and less indicating that in a reasonable period of time it would clean up. Both zones are in the Repetto formation.

Much credit is due the officials of Fullerton Oil Co. for making the second important California discovery of the year, the only other being the bringing in of Del Valle in August. No great drilling boom is expected as adjoining properties are owned by Standard Oil Co. and Union Oil Co. The well is located 150 ft. north and 150 ft. west from the southeast corner of sec. 25,2-11 in an area where several old wells produced small quantities of oil from very shallow depths.

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Rankin & Williams	1	7, 3-13	7450	Drilling
Castaic	Colter, R. T., Explor.	1	8, 4-17	1338	Idle
	Havenstrite, R. E., Lincoln	2	16, 4-17	6037	Drilling
	Pedro Pet. Co., Oates	1	24, 5-17	2205	Idle
	Western Gulf Oil Co., Lechler	1	31, 5-17		Rigging up
	Worland Oil Co., Jenkins-Owens	1	18, 5-16	2950	Stdg. plugged
Domingues, West	Wood-Mellon Oil Co., Wood	1	31, 3-13	7498	Pumping
La Habra	Fullerton Oil Co.	6	25, 2-11	6006	Shut-in
Mint Canyon	Redwood Oil Co., Mitchell	2	22, 4-15	1580	Idle
Malibu	Sovereign Oil Corp., Sovereign-Marblehead	1	7, 2-18	3469	Idle–may deepen
Monterey Park	United Petroleum Co., Haig	1	26, 1-12	3370	Cleaned out
Newhall	Canyon Oil Co., Sanborn	1	6, 3-16		Rig
	Creighton Hammon Synd., C. H.	1	17, 3-16	990	Idle
	Lee, Wm. Y., Irene	1	31, 4-15	300	Idle
Palos Verdes	Rolling Hills Pet.	1	27, 4-14	6580	Idle
Redondo	Calif. Oil & Ref. Co., Cal-o	1	18, 4-14		Location
Torrance-Wilmington	Silver Pet. Co.	1	30, 4-13	3500	Drilling
	Bristol Oil Co., Spring	1	30, 4-13		Location
San Fernando	Casa Grande Oil Co., Lopez-Lundy	1	1, 2-15	3785	Idle
West Whittier	Cal. Pico Oil Co., Beach	1	7, 2-11	7788	Idle
	Orange County				
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5649	Idle
	San Bernardino County				
Carbon Canyon	Earp, H. R., Kraemer-Backs	1	34, 2-8	1352	Idle
	May, Homer, Oasis	1	31, 2-8		Rig

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Madera	Blake, T. N., Arnold	1	22, 10-17	3204	Pumping
Merced	Don Pedro Oil Co.	1	9, 6s-9e	1906	Idle
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	2175	Idle
	Priest Valley Pet. Co., Greve	1	22, 20s-12e	2885	Stdg. cem.
Sacramento	Independent Exp. Co., Perry	1	19, 7n-6e	4806	Reaming
San Joaquin	Standard Oil Co., Blewett	1	25, 3s-6e	3355	Drilling
San Mateo	Ra-Lite Petroleum, Inc., Bell	5	16, 7s-4w	1200	Idle
Solano	Richfield Oil Corp., Potrero Hills	3	10, 4n-1w	2555	Drilling
Yolo	Standard Oil Co., Tippets	2-1	9, 12n-3w	3151	Drilling
Yuba	Wright, L. G., Cox	1	18, 14n-5e	1795	Idle

San Joaquin Valley

Kern Line To Case Grapevine Wildcat

The local office of the Kern Line Oil Co. announces that casing will be run for tests of its 8320 ft. wildcat in sec. 19,11-19 on the Grapevine plains.

Core recovery was poor in this well and the pipe will be run on the strength of electric log showings, according to the operator. Since the well is far removed from previous drilling there is little against which to check the log picture, and some believe it possible that the resistivity curves may have been confused with those similarly obtained from logs of fresh water sands. Tests alone can prove or disprove the divergence of opinion.

Southeast of here in sec. 2,10-19, Richfield Oil Corp.'s No. 1 well on the Tejon Ranch is spot coring at 9322 ft. Located southeast of the small Grapevine Pool, the well is exploring virgin territory and may be carried to considerable depth to completely examine the geologic section at this point.

Richfield Deepens Wheeler Ridge No. 2

After obtaining a surprise flow of 1950 grain salt water cutting only 1% oil from apparently promising sands at 10,934 ft., Richfield Oil Corp. is below 11,000 ft. in deepening operations on Wheeler Ridge-KCL No. 2.

Located south of the shallow Wheeler Ridge field, near the south quarter corner of sec. 28,11-20, the well is believed drilling in a continuation of the fine grained Eocene sand which prompted the flow test.

While the sand is comparable to that which flowed only salt water in repeated tests on well No. 1, some 1800 ft. to the northeast, it was believed that sands here held more promise, thanks to better cuts and the appearance of more permeability.

At the present time the well has penetrated almost to the same stratigraphic level as the original 11,168 ft. well due to a lower surface elevation. Additional drilling thus assumes even greater importance since it is in a heretofore uexplored section of the Eocene in this south valley location.

Important Extensions Loom at Kettleman

The current Eocene sand drilling program in the Kettleman North Dome field enters a clarifying stage by the entry of several wells into the rich sands.

Substantial production has already been obtained by a dozen or so wells high on the structure, and the current wells will in part delineate the productive area of the horizon.

At the extreme northwest tip of the field, where most of the Eocene production has been found, Standard Oil Co.'s well No. 344-13H entered the McAdams sand or the first Eocene sand member at 10,789 ft. With bottom at 10,873 ft. tests are immediately forthcoming to try the productivity of the zone at this point. While 344-13H is 78 ft. lower on structure than nearest Eocene production, KNDA's well No. 27-18J, it is probable the well will be productive since No. 27-18J made 1392 bbls. of clean 33.6 gravity oil from 170 ft. of formation to plugged bottom at 10,870 ft.

In the same section of the field, Standard's 311-33J also found the McAdams sand at 9805 ft. and completed from 10,125 ft. for a substantial flow of 50 gravity oil and 10,600,000 cu. ft. of gas.

First to drill into the McAdams sand on the northeasterly flank of the central section of the field is Robert S. Lytle's Felix No. 5. Located near the south quarter corner of sec. 35,21-17, the well located the sand on a drilling break at 10,548 ft. and with bottom at 10,573 ft. is standing with 6⅝ in. casing cemented at 10,540 ft.

Not yet classified as in the sand, but bottomed at 10,438 ft. which appears near enough to find stratigraphic markers if present here, is Standard Oil Co.'s well No. 1-1U at the extreme southeast tip of the hills.

Last reported running an electric log to determine its position in the section, this well in the northwest corner of sec. 1,23-18 is important as

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
Fresno County					
Coalinga	Lewis, C. H.	1	18, 21-15	2298	Idle
Gatos Creek	Gatos Creek Oil Co.	1	19, 19-13	725	Drilling
Mendota	Jergins Oil Co., Cheney Ranch	1	29, 14-13	9345	Idle
		2	29, 14-13	6977	Drilling
Kern County					
Belridge—South	DeLanty & Sutton, Trustees	1	28, 28-22	3020	Idle
	Santa Mora Oil Co.	1	10, 28-20	544	Idle
Buttonwillow	The Texas Co., S. P.	47–15	15, 29-24		Grading
Devils Den	Herzog, R. D., Marine	28	26, 25-18	141	Rig pump
Edison	Goodrum & Vincent, Inc., S. P.	7	31, 29-30	460	Idle
Grapevine	Kern Line Oil Co.	1	19, 11-19	8320	Circulating
	Richfield Oil Corp., Tejon Ranch	1	2, 10-19	9340	Drilling
Lost Hills	Argo Pet. Corp., Farnsworth	1-A	11, 26-20	1332	Rng. liner
	Randan Pet. Corp., Theta	1	3, 26-20	1625	Rigged up—Idle
	The Texas Co., Theta	2–28	2, 26-20	1301	Pumping
McKittrick	Smith, Ebert E., Smithhart	1	34, 30-22	2300	Idle
Richgrove	Borget, A. J., Kendall	1	16, 25-27	40	Idle
Round Mountain	Spartan Drlg. Co., Hiatt	1	32, 28-29	2085	Idle
Shafter	Continental Oil Co., KCL	C–2	35, 27-24		Foundation
Strand	Tide Water Assoc. Oil Co., KCL	56–8	8, 30-26		Location
Union Avenue	Hancock Oil Co., Roberts	1	6, 30-28	5100	Drilling
Wheeler Ridge	Richfield Oil Corp.	KCL 2	28, 11-20	11010	Drilling
Kings County					
Pyramid Hills	Pyramid Prod. Co., Spreckles	2	16, 24-18		Rig
Reef Ridge	Blair Oil Co., Blair	1	24, 23-16	72	Idle

an indicator of the stratigraphic value of the McAdams sand. If found producible here, it will indicate that the sedimentation is regular and conformable to the Temblor production already well defined in the field. However if missed here it does not condemn the possibility of Eocene production at the extreme south tip of the field since nothing has been yet discovered to prevent a possibility that the axis of the deep sand varies from the shallower, and that a location to either side of the present shallow axis might find saturated sands.

Jergins Test Near Gas Zone

Last reported at 6977 ft. Jergins Oil Co.'s Cheney Ranch No. 2 is believed over the zone which produced a small volume, high pressure gas flow in well No. 1. Located a short distance southeast of Cheney Ranch No. 1 in sec. 29,14-13 in the Mendota area of Fresno county, the current well is running slightly structurally lower than the original well which topped the Cretaceous gas sands at approximately 6900 ft.

A recently completed formation test of the interval 6770 to 6825 ft. recovered a small amount of mud with no trace of oil or gas. Tests of the expected zone are hoped to show more reservoir capacity than was present in the first well.

Bristol Sharpshooting Old South Dome Well

Bristol Oil Co., which acquired the old Ohio Co. Smith No. 1 in the Kettleman South Dome area ,has entered the 8054 ft. hole and is gun perforating and testing several intervals which according to the operator appear potentially producible.

Located in the southwest corner of sec. 35,24-19, the well was originly drilled in early 1929 and carried to present bottom. The hole is cased with a string of 6⅝ in. cemented on the stub of 9 in. casing at 4300 ft. The 9 in. carries to 6690 ft.

Earlier tests by Bristol near the 5600 ft. level produced no yield and the current jobs are near the 5000 ft. mark.

Contrast Planned In Elk Hills Tries

Employing the latest and biggest in drilling equipment, Standard Oil Co.'s scheduled "Basement Special", well No. 42-31S, is already below 1500 ft. on sec. 31,30-24.

Planning to prospect as deep as possible with this equipment, Standard affords a contrast in both plans and rigs by locating No. 44-29S in sec. 29,30-24 for the purpose of a look down to only 4000 ft.

Each well keys into the probable 1941 program of most large operators; namely an aggressive intention to find either new fields or deeper sands in existing fields: a program made necessary by lack of discovery in the past year and a half. Such discoveries are vital to insure continued stocks for an industry

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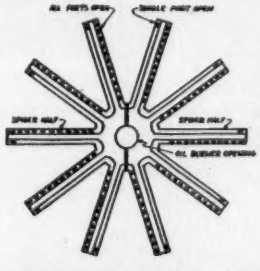

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Alford Completes Good Midway Pumper

In sec. 25,12-24 in the southerly section of the Sunset-Midway field, Alford Oil Co. has finished Fried No. 9 pumping 255 bbl. of 23.5 gravity oil cutting 5.0%. The grease is coming from a 100 ft. perforated interval in 6⅝ in. liner landed on bottom at 2873 ft.

Golden Bear Oil Co. is rigging pump to test poor oil sand cored from 3018 to 3062 ft. in Heyler No. A on sec. 32,31-23. Bottomed at 3069 ft., the well is claimed to offer little promise of substantial production.

Marvic Associates, Inc.'s well No. 1 in sec. 16,31-22 is recementing 8⅝ in. casing at 848 ft. in its 880 ft. hole.

North American Oil Cons.'s W.P. No. 1-28 is in brown shale at 3895 ft. in sec. 28,32-23.

McDonald & Dearin Spud at Kern Front

Only well at present working in the Kern Front field is McDonald & Dearin's well No. 7. Located in sec. 28-27, at the north flank of the field, No. 1 was last reported at 305 ft. Production here is normally found in the Pliocene at about 1650 ft.

Devils Den Try Rigging Pump

Raymond D. Herzog's Marine No. 28 in sec. 26,25-18 in the Devils Den area is bottomed at 141 ft. and is rigging pump to test. Production is hoped for in the small volume sands which produce low gravity crude possessing exceptionally good lube stock qualities.

Smith Well Idle At McKittrick

Bottomed at 2302 ft., Ebert E. Smith's Smithart No. 1 has suspended operations in sec. 3,30-22. Little is known concerning formations encountered in this well which is near numerous other shallow wells which failed to find production.

Barren Oil Try Converted Gasser

Trico Oil & Gas Co., which assumed Tide Water Associated Oil Co.'s Daniel No. 35-22, barren 11,728 ft. oil try in sec. 22,24-23, has completed for 10,000,000 cu. ft. of gas after plugging to the Mya zones at 2500 ft.

Trico took over the well for gas completion when Tide Water finished operations on the lease for which it held only oil rights.

Inclemency Stalls Reef Ridge Wildcat

Bogged down by torrential rains and wind which recently swept the major portion of the Valley, Blair Oil Co.'s test of sec. 24,23-16 at Reef Ridge is idle after making only 72 ft.

Northwest of here, in the Pyramid Hills area, Pyramid Prod. Co. has built rig for Spreckles No. 2 in sec. 16,24-18.

Signal Oil Loses Pioneer Gas Lease Man

Word has just reached us of the passing of Joe Gosling, well known in the oil fields of Southern California as one of the best gas lease men in the business. First stricken with a heart attack in May,

1939 while attending a company golf tournament. Mr. Gosling spent the last 18 months of his life fighting to recover from what proved to be a serious heart ailment. His sudden passing on Sunday, December 15, ended a very active career in the oil and gas business.

A native of Wisconsin, Mr. Gosling sold out his interests in that state and came to California in 1922, where he first entered the oil business as organizer of the Conductor's Oil Co., which drilled one of the first wells on Signal Hill. Later he went into the leasing business as an independent operator in leases and royalties and on September 15, 1924 he joined the leasing department of the Signal Gasoline Co. when the company, then only two years old, was becoming known as a producer of casinghead gasoline.

Mr. Gosling is survived by his widow, Mrs. Maude E. Gosling and son, Joseph Gosling, Jr.

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Coastal District

Hancock Logging Union Ave. "Cat"

With results of the picture to determine the future of Hancock Oil Co.'s Roberts No. 1, electric log is being run to bottom at 5200 ft.

Located at the outskirts of Bakersfield on Union Avenue plunge property in sec. 6,30-28, the well cored 45 ft. of poor oil sand in the Chanac below 4085 ft. and reports a slightly better looking strata of oil sand at 4965 ft.

Bottom formation is believed to correspond to the Santa Margarita zone tested in Richfield Oil Corp.'s 10,427 ft. wildcat in the same section during 1939. The Richfield well bottomed in the Vedder zone which was reported to be all shale.

Since Richfield's sole results were traces of oil on formation tests of the Santa Margarita from 5179 to 5221 ft., it is thought that Hancock's future operations in the area will be predicated on future results of the lower sands.

Bad Weather Bothers Many Ventura Wildcats

Most of the wildcats in Ventura county were caused much inconvenience by the recent heavy rains rendering roads impassable. In Eureka canyon south of Piru, Oilexco, Inc. was forced to abandon operations for an indefinite period while nearly all companies lost from one to four days repairing washouts.

Intercounties Fuel Co. lost comparatively little time and is again drilling Hinkley No. 1 near the mouth of Sespe Canyon in sec. 22, 4-19. Using a spudder type cable tool rig, bottom was last reported at 450 ft.

With a 5½ in. liner containing 175 ft. of perforations landed on redrilled bottom at 2995 ft., American Seamless Tube Corp. is testing its Basola No. 1 in sec. 5,3-19 east of Bardsdale. Some oil is being recovered but no definite results are yet known.

Roads are being repaired in the east South Mountain area where Comstock Petroleum Co. was forced to suspend drilling at approximately 1800 ft. The adjoining California Securities Oil Co. well continues, however to pump water with a little oil.

Norwood Oil Co.'s Cornet No. 4, located in sec. 17,4-21 between Ojai and Santa Paula, is flowing at the estimated rate of 35 bbls. per day of 30 gravity oil cutting 6.0%. The hole is open from 3130 to 3250 ft.

Hopland Oil Co. is reported to have resumed drilling its test of a promising structure in Wiley Canyon, sec. 1,3-19. Depth is around 500 ft.

Lloyd Corp. Finishes Good Avenue Producer

Lloyd Corp., headed by pioneer oilman Ralph B. Lloyd, brought in well No. 5 on fee owned land on the north flank of the Ventura Avenue field flowing initially at a 1400 bbl. rate through a 24/64 in. bean from the interval 8520-8690 ft. Accompanying the oil was 691,000 cu. ft. of gas. Beaned back to 12/64 in., production was 570 bbls. a day of 32 gravity oil and 691,000 cu. ft. gas. The hole had been drilled to 10,475 ft. but was plugged back when tests of the lower zones were unsatisfactory.

Lloyd Corp. No. 6, jinx of the field, may be out of the woods now as the fish which held up operations for two months has been sidetracked. Bottom was last reported at 8700 ft.

British American Oil Producing Co. finished its No. 11 on the Bolsa Chica Oil Co. Hartmann lease but production figures were not available at this writing. Approximately 350 ft. of formation is open to bottom at 8719 ft. No. 12 will be started within a few days.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
	Santa Barbara County				
Elwood	Bolsa Chica Oil Co., Permit	191–7	24, 4-29	4313	Idle
	The Texas Co., Bishop	A–2	13, 4-29		Location
Goleta	Coates, Spencer D., Hollister	2–A	3, 4-29	1570	Idle
Summerland	Barnato Corp., The, Hyland	1	16, 4-26	3415	Idle
	San Luis Obispo County				
Huasna	Tex Harvey Oil Corp., Gilmore Comm.	1	11, 32-14	4518	Rigging pump
	Ventura County				
Bardsdale	American Seamless Tube Corp., Basola	1	5, 3-19	3140	Running tubing
	Elkins, Reed	1	5, 3-19	902	Idle
	Hopland Oil Co.	1	1, 3-19	518	Idle
	Palma Oil Co., Elkins	1	8, 3-19		Grade
	Westoil Corp.	1	6, 3-19	525	Idle
Conejo	Sulphur Springs Oil Co., Janss	1	33, 2-19	4526	Idle
Ojai	Seaport Oil Corp., Arnett	3	15, 4-21	2532	Testing
	Norwood Oil Co., Coronet	2	17, 4-21	3250	Completed
	Norwood Oil Co., Coronet	3	17, 4-21		Grade
	Per-Col Oil Co., Anlauf	6	21, 4-21	2105	Idle
Oxnard	Bender, E. A., Farrell	1A	5, 1-22	5007	Idle
	The Texas Co., Montgomery	1	13, 2-22	2158	Drilling
Piru	Nelson, D. V., P.F.C.—C.H.	1	19, 4-18	510	Drilling
	Oilexco, Inc., Newhall-Lund	2	2, 3-18	570	Idle
	Oilexco, Inc., Stevens	1	34, 4-18	373	Idle
Sespe	Inter Counties Fuel Co.	1A	22, 4-19	450	Drilling
	Riley, Irene Burson	1	18, 4-19	2050	Idle
	Rio Hondo Oil Co., Cosby	1	14, 4-19	1695	Idle
	Signal Petroleum Co.	7	13, 4-19	1850	Drilling
South Mountain	Bolling Oil Co., Schieferle	1	17, 3-29		Cellar
	Calif. Securities Oil Co., Schieferle	1	17, 3-29	4501	Pumping
	Comstock Pet. Co.	1	17, 3-29	1800	Idle
	South Mountain Oil Co.	1	10, 3-20		Location
Sulphur Mt.	Madison Oil Co., Delphy	1	24, 2-22	2500	Idle

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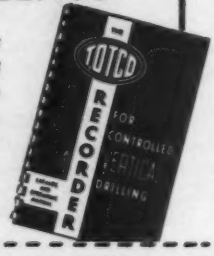

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Shell Oil Co., Inc. is recompleting Taylor No. 65 after landing a liner on redrilled bottom at 5780 ft. and cementing through perforations at 5622 ft. The company is running three strings of tools at present on the Taylor lease.

Tide Water Associated Oil Co. has three drillers, two of which are standing cemented. V.L.&W. No. 47 set 10¾ in. pipe at 6550 ft. while McGonigle No. 20 has 7 in. at 8045 ft. Both wells will be deepened before being tested for production.

Tide Water's last completion, Lloyd No. 115, is flowing 475 bbls. of 31.6 gravity oil cutting 4.0% through 16/64 in. bean.

Huasna Wildcat Rigs to Pump

After several days swabbing recovered fluid cutting about 70% compáratively fresh water, "Tex" Harvey Oil Corp. is preparing to pump its Gilmore Community No. 1 in the Huasna area of San Luis Obispo county. Located in sec. 11, 32-14, the hole was drilled to 4518 ft. passing through some volcanic material of Miocene age near the 4300 ft. level. Monterey shale showing heavy oil in fractures was reported from 875 ft. to 2900 ft. where 400 ft. of Tuff was encountered. Below 3300 ft., formations were largely black shale with streaks of sand showing fairly light cuts.

Casing was cemented at 3530 ft. and a spot perforated liner run to 4462 ft. for the production test now in progress. During the first two days swabbing, the well made two short heads in each of which was a small amount of oil said to test 26.2 gravity. The commercial value of the project will be proved by the pumping trial by the first of January.

Showings in the Huasna Valley are nothing new as every well drilled there has encountered a small amount of heavy oil in the fractures of the Monterey shale which is very thick in this area. Hancock Oil Co.'s Sherer-Dickes No. 1 recovered as much as 90 bbls. a day of 10 gravity oil but has stood idle for two and a half years because of unfavorable

When you prepare your list of "POSSIBLE SAVINGS"

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market conditions and high transportation costs. The "Tex" Harvey well appears to have penetrated the Miocene to a greater stratigraphic depth than the others and the comparatively high gravity oil indicates much better potentialities.

Union Completing Santa Maria Well

Near the west end of the huge Santa Maria Valley field, Union Oil Co. is completing its sixth well on the Le Roy lease. Bottomed in Franciscan at 5306 ft., a combination string of 5¾ in. casing was landed at 5295 ft. and cemented at 4921 ft., the top of the perforated interval. Exceptionally good drilling time was made on this well, having spudded Nov. 29.

Union's Morrison No. 3, only drilling well in the Valley, is below 3500 ft. while the company's latest completion, McCoy-Cooney No. 2 is pumping 150 bbls. of 13 gravity oil cutting 17%. Both are in sec. 27, 10-34. Derrick is standing for Vincent No. 6 while locations have been surveyed for Moretti No. 3-1 and Fleisher No. 1.

Oxnard Wildcat Passes 2000 Ft.

Montgomery No. 1, The Texas Co.'s new Oxnard wildcat, is making good time in the upper horizons, having passed the 2000 ft. mark already. Surface casing was cemented at 1001 ft. The project is located northeast of town in sec. 13,2-22.

E. A. Bender's Farrell No. 1 west of the city is still idle at 5007 ft. but may resume drilling at an early date.

Urge California Join Interstate Oil Compact

A recommendation that California become a member of the Interstate Oil Compact has been made by the Board of Directors of Oil Producers Agency of California. The recommendation, in the form of a resolution, is being mailed today to all the members of the State Legislature, as well as to Governor Olson and the Director of Natural Resources, Richard Sachse.

"The Interstate Oil Compact, which has been in existence since 1935, consists of a group of oil producing states each of which has agreed to prevent physical waste in the production of oil," according to L. L. Aubert, president of the Agency. "California, through its Natural Resources Code and its Division of Oil and Gas, which administers the Code, already has the requisite legislation on its statute books. For us to join the compact requires only the passage of an enabling act by the State Legislature. Members of the Interstate Compact are not bound by the action of the Interstate Compact Commission, which functions purely in an advisory capacity, nor is it necessary for member states to have laws controlling the production of oil. As far as California is concerned, the state can become a member of the compact with no further legislation, and can function as a full member-state under the voluntary conservation program now in effect here.

"The Agency Board is of the opinion that for California to join the compact will strengthen the oil industry's nationwide efforts to conserve oil. As a member, California will be entitled to take full part in the deliberations of the Compact Commission, which meets quarterly. At present, not being a member, California has been limited to the mere observance of action taken by the Commission, and has not been able to assist in the formulation of policy," Mr. Aubert said.

The resolution of the Agency Board follows in full:

Whereas, on Feb. 16, 1935, the States of Colorado, Illinois, Kansas, New Mexico, Oklahoma and Texas entered into an interstate agreement, known as the Interstate Compact to Conserve Oil and Gas; and

Whereas, since said time nearly all of the other principal oil producing states of the Union excepting California have become parties thereto; and

Whereas, under said Compact said states severally agree to enact and enforce laws to conserve oil and gas by the prevention of physical waste thereof from any cause; and

Whereas, the State of California now has upon its statute books laws for the conservation of gas, for the protection of underground strata from water infiltration, for the avoidance of unnecessary fire hazards, for the proper spacing of wells, and for the efficient use of reservoir energy in producing wells, and said State is enforcing said laws; which constitutes without further enactments compliance with the requirements of said Compact; and

Whereas, for the proper coordination of the activities of the oil States in conservation, it is helpful and beneficial for each and all of them to become a party to said Compact; and

Whereas, under said Compact each State reserves its full freedom of action, there being no power of compulsion by any state or states against the other in the provisions thereof, the strength of said Compact resting in conference and example:

Now, Therefore, Be It Resolved, by the Board of Directors of Oil Producers Agency of California, this 18th day of December, 1940, that in the opinion of this Board of Directors it will be helpful to the conservation of petroleum and gas, for California to become a party to said Compact; and

Be It Further Resolved, that copies of this resolution be forwarded to the Governor of the State of California and to each California State Legislator, and to the Director of Natural Resources of the State.

Aviation Gasoline Buying Is Delayed

After six months of study and consideration, the government's proposed plan to purchase and store aviation gasoline for defense purposes is still bogged down by lack of agreement between the army and navy and defense commission. The plan was thought to be ready for execution last month on a greatly reduced scale calling for buying of 3,500,000 bbls. of 100 octane gasoline over the whole of 1941, but negotiations have fallen down on how much should be purchased in the first half of the year Because their funds are limited, the army and navy want to buy only small quantities of this gasoline during the first six months of 1941, and to secure most of this fuel in the last half of the year.

The defense commission wants to follow exactly the reverse procedure. The commission fears what might happen if an emergency happened soon and no real storage had been provided. The service agencies are now building underground storage tanks for the 100 octane fuel, to be completed at the end of 1941. Meantime, tankage is being expanded at various air fields, and the services are buying considerable gasoline for storage for current consumption now.

Says Lack of Oil May Beat Germany

England controls more than half the world's tanker tonnage, totaling some 5,000,000 tons, reports a story from Toronto, stating that this stranglehold on the world's petroleum resources may prove to be the decisive factor in defeating Germany. This may also explain in part the great shortage of tankers for domestic use in this country, which is creating a situation that is serious.

Here's the Open House and Farewell Party Oil Well Supply gave recently in honor of J. B. Kissinger, who retires after 45 years of service. "Jake", as he is affectionately known, is, at left, standing between Clarence Hill and Lester Keim.

Oil Producers Interested In Generating Plants

The recent interest on the part of the petroleum industry in the possibilities of utilizing its own products for the generation of electric power for use on its producing properties is but a logical development of the times. Natural gas engines have reached such a high degree of perfection that interruption of power due to engine difficulties is a rarity in those cases where such plants have been operated during past years.

An example of such a plant is that which has been operated since 1934 on the Brea property of the Birch Oil Co. (See California Oil World, July 26, 1934).

In this plant two Clark multi-cylinder four cycle natural gas engines direct connected to 440 volt generators operating in parallel provide all electricity required by the pumping wells, well servicing mottors, shops and lighting circuits on the lease. In spite of the fluctuating load caused by oil well pumping operations, no difficulty in governing and synchronization have been experienced. Fuel is produced by the wells on the property. Interruptions of power from any cause are reported to be less frequent.

Clark Bros. Co., Inc. are now in a position to supply moderate speed multicylinder four cycle engines over the range from 120 to 500 h.p. for power generating purposes. The later models have oil cooled pistons to eliminate ring stickage, and are convertible to full diesel design. They are so fully enclosed as to be practically dust-proof and yet the enclosing covers can be quickly and easily removed when repairs are necessary.

In the days when the operator could sell all oil produced at nice profits, economies such as generating plants received small consideration. In these days of curtailment and narrow margins between producing costs and selling prices, self-owned engine driven generator plants provide one method of making substantial reductions in production costs and overhead.

LAUGH THIS OFF

During the Christmas season when we completely forget the future in order to take a good look at the present, two types of oil men are particularly noticeable: There is the chap who is trying to make his lighter work, and the one who is trying to make his work lighter.

And on the same subject **Otis Hoyt** tells a very pathetic story about a lad who hung one of his socks on the Christmas tree of a Long Beach well. All he got was a notice from the health department.

Also, to save you a lot of useless tramping around, **Mark Payne** advises that for the women you just buy cosmetics. Makeup, he contends, is something that few women have the face to go without.

In these modern times a woman's face is very much like a man's excuse. She makes it up as she goes along.

Pop Whisler, by the way, once knew a driller who was so tough he trimmed his nails with a buzzsaw, and kept his chin stubble down with sandpaper.

And before abandoning the topic, you have perhaps heard of the slightly spiffed individual who opened the door and called in, "Shay, ish thish a beauty shop?" "Yes, it is," replied a voice from the rear. "Thash jus' dandy", enthused the reveler, "Bring ourra couple an' lemme shee 'um".

Now comes **Joe Clark** with a sad yarn if it's true: Says the pipeline superintendent to the guy who had been transferred from another department, "Aren't you the same fellow that strung pipe for me last summer?" "No I ain't" was the instant reply, "And what's more the Doc says I never will be".

"Don't get fresh", continues the supe, "I've never let one of my men make a monkey out of me yet". "Zat so?" enquired the new boy innocently, "Well—who done it?"

It sounds a bit ridiculous, but **Fred Vaile,** famous Pomona grid star, declares that an immigrant from the Kentucky mountains was given a new coat by one of the local welfare societies last Christmas. A member of the society later called him to find out how it was. The fellow said it was just swell but he couldn't get used to the wood across the shoulders and the hook kept pushing his hat off.

Reminding us of **Roy Hornidge's** yarn about the accountant who couldn't get his slicker on because he had a book in his hand and it was too big to go through the sleeve.

Diverging ever so slightly here, **Bob Roberts** believes that one of the most pathetic sights imaginable in this machine age is a horsefly on an automobile radiator.

Again on the subject of the festive season, an oil magnate gave an old fur coat to his negro janitor as a Christmas present some years ago. One of the boys from the office met the cullud gemman on the street next day, all dressed up in the new vestment. "It's pretty cold today, Sam." he remarked. Haughtily lifting his chin from the depths of the fur collar, Sam replied with the utmost disdain, "Ah caint tell nuthin' about the weathah, Boss. Ah ain't looked at de paper dis mawnin".

The Christmas spirit, it should be understood, is something that just wells up inside of a fellow when the circumstances are right. It can't be acquired by absorption.

We remember distinctly one poor soul who protested bitterly that he couldn't sleep a wink on Christmas Eve for the waits singing "Silent Nights".

He got so mad about it, he got up and threw a pail of water on them. Which again proves that all things come to him who waits.

And brings us to the end of this very chummy session. Remember, it's silly to be patching up old quarrels when it is so easy to make new ones.

So let's all go and listen to the Christmas bills.

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BIDS ON OIL LEASE SALE

Nov. 25, 1940.—United States Department of the Interior, District Land Office, Sacramento, California. Notice is hereby given that the SE¼ NE¼ Sec. 4, NE¼ NE¼, except the S½ SE¼ NE¼ NE¼, Sec. 27, T. 32 S., R. 23 E., M.D.M., California, containing 75 acres in the Midway Field, California, are offered to the responsible qualified bidder of the highest bonus per acre for lease under section 17 of the act of February 25, 1920 (41 Stat. 437), as amended by the act of August 21, 1935 (49 Stat. 674), at the royalty rate scale in the lease form shown in Circular 1386, at a sale to be held in the District Land Office, Sacramento, California, at 11:00 o'clock, a.m., on Jan. 10, 1941. The successful bidder must deposit on the date of the sale a certified check on a solvent bank, or cash, for 1/5 of the amount bid, and file the showing of qualifications to receive a lease, required by section 7 of Circular 1386. The remainder of the bonus bid and the annual rental of $1 per acre must be paid and a $5000 corporate surety bond must be furnished prior to the issuance of the lease. The bidders are warned against violation of the provisions of Sec. 59 of the United States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids at the discretion of the Secretary of the Interior. Ellis Purlee, Register. 1/5t

Oil Men's Calendar

Calif. Natural Gasoline Association. **Los Angeles Chapter**—Meets 1st Thursday Each Month, Barker Bros. Bldg., Los Angeles—Dinner at 6:00 (Optional). **Taft Chapter**—Meets Third Thursday Each Month.

American Society of Mechanical Engineers—Los Angeles Section—Meets 2nd Thursday Each Month—Barker Bros. Bldg., Los Angeles. Dinner at 6:30 (Optional).

1941

January

6-10—Society of Automotive Engineers, Annual Meeting (and Engineering Display) Book-Cadillac Hotel, Detroit, Mich.

16-17—Liquefied Petroleum Gas Assn., eastern section, regional meeting, N. Y.

20-21—Compressed Gas Manufacturers Assn. Inc., annual meeting, N. Y.

February

17-20—American Institute of Mining & Metallurgical Engineers, Engineering Societies Building and Commodore Hotel, New York.

19-21—Association of Highway Officials of North Atlantic States, Hotel Statler, Boston, Mass.

24-25—Liquefied Petroleum Gas Assn. Inc., annual convention, Chicago, Ill.

26-28—Iowa Independent Oil Jobbers Assn., Des Moines, Iowa.

27-28—American Petroleum Institute, Division of Production, Southwestern District, Washington - Youree Hotel, Shreveport, La.

March

3-7—American Society for Testing Materials, Hotel Mayflower, Washington, D. C.

11—American Petroleum Institute, Division of Production, spring meeting, Pacific Coast District, Biltmore Hotel, Los Angeles, Calif.

17-22—Oil Burner Institute's National Oil Burner Progress Exhibition, Commercial Museum, Philadelphia, Pa.

25—Oil Trades Assn. of New York, annual meeting, Waldorf-Astoria Hotel, New York.

April

2-4—American Assn. of Petroleum Geologists, 26th annual meeting, Rice Hotel, Houston, Texas.

7-11—American Chemical Society, St. Louis, Mo.

17-18—American Petroleum Institute, Division of Production, Wm. Penn Hotel, Pittsburgh, Pa.

23-25—Fuel Oil Distributors Assn., Asbury Park, N. J.

23-25 — Petroleum Industry Electrical Assn., Mayo Hotel, Tulsa, Okla.

23-25—Natural Gasoline Assn. of America, annual convention, Baker Hotel, Dallas.

24-25—National Petroleum Assn., Cleveland Hotel, Cleveland, Ohio.

25-26—Petroleum and Natural Gas Conference, State College, Pa.

May

5-8—American Gas Assn., Natural Gas Section, Dallas, Texas.

19-23—American Petroleum Institute, 11th mid-year meeting, Mayo Hotel, Tulsa, Okla.

June

23-27—American Society for Testing Materials, 44th annual meeting, Palmer House, Chicago, Ill.

November

3-7—American Petroleum Institute, 22nd annual meeting, San Francisco, Calif.

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